

PUBLIC WORKS

Nov.
1960

CITY, COUNTY AND STATE

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ODD WASTE DISPOSERS
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page 5



Roy W. Morse, City Engineer of Seattle, Washington, recently selected as one of the "Ten Top Public Works Men of the Year," is shown against the background of a street improvement project. More data on page 18.

PROPER Pre-Shipment TESTING Assures PROFITABLE PERFORMANCE in the Field....



IN addition to undergoing exacting tests for mechanical operating efficiency, each GALION Motor Grader, before shipment, receives a thorough engine operation and analysis check on a Clayton Dynamometer.

As a result downtime in the field, due to "new equipment" adjustments and tuning, has been reduced to a negligible point.

The tests and adjustments are made according to scientific standards. Guess-work, opinions and uncertainties are eliminated. You are assured a grader on which all mechanical parts function properly and the engine delivers top horsepower and speed with utmost fuel economy.

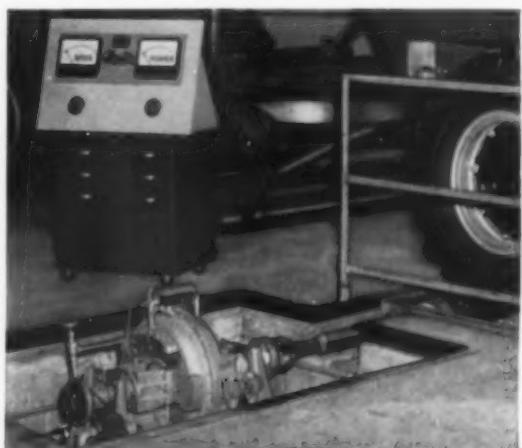
The grader is first tested and adjusted in its highest gear at full throttle for smooth operation with no load. Next the road speed and horsepower are checked under a full load condition. The Dynamometer operator easily controls the load or changes it at will by two remote control buttons.

Speed and torque measurements are electrically integrated, permitting horsepower readings to be shown directly on a large meter without computations being necessary. A matching electric meter shows road speeds in mph regardless of the tire size or rear axle ratio.

For profitable performance — buy GALION! See your Galion Distributor or write direct to The Galion Iron Works & Mfg. Company, Galion, Ohio, U. S. A.



After an initial warm-up period, the grader is moved into place with its tandem drive wheels resting on the Dynamometer testing rolls.

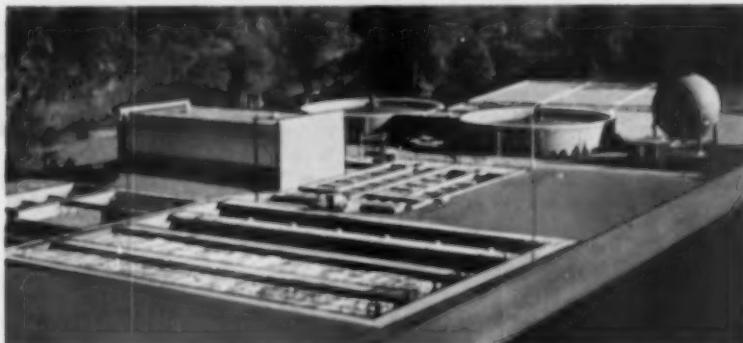


Working conditions are simulated by imposing loads on the Dynamometer rolls thru a closed hydraulic power absorption system.

SAFER, MORE EFFECTIVE MUNICIPAL SEWAGE TREATMENT

"*from Chicago*"

Pleasant Hills Authority, Pennsylvania



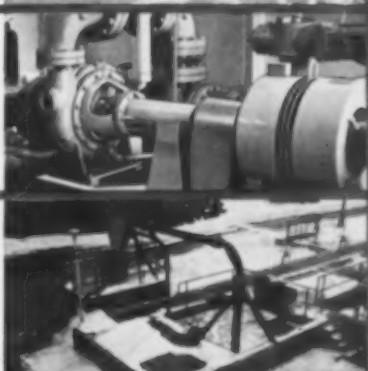
Consoer, Townsend &
Associates—Engineer
The Rust Engineering
Company—Contractor

Exclusively
Successful
Sewage
Treatment
Equipment

Swing Diffuser Air Diffusion Equipment for Dependable, Continuous Aeration.



SP-5 Pumps for High Head, Heavy Duty Raw Sewage Pumping



OTHER CHICAGO PUMP

EQUIPMENT AT
PLEASANT HILLS

Chicago Communitors

Non Clog Sewage
Pumps

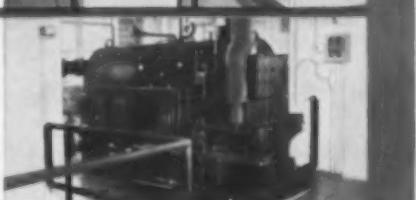
Utility Water Pumps

Precision Diffuser Tubes

Aer-Degritter Grit Removal System for Controlled Washing, Transporting and Concentrating Grit



Scru-Peller Pumps for Clog-Proof Primary Sludge Pumping



Chicago-Cyclotherm Sludge Heat Exchanger and Digester Heater

Putting Ideas to Work

FOOD MACHINERY AND CHEMICAL CORPORATION
HYDRODYNAMICS DIVISION

CHICAGO PUMP

632F DIVERSEY PARKWAY • CHICAGO 14, ILLINOIS



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Distributors Located in Principal Cities Throughout The United States and Foreign Countries.



Here's why the NEW No. 944 Traxcavator is bringing NEW standards to wheel loader operation

CHECK THESE FEATURES

- **2 cu. yd. bucket**
- **Power shift transmission** and torque converter—provide smooth, instant finger-tip shifting. No clutching necessary.
- **Travel-work range power selection**—travel range gives 2-wheel drive for roading. Work range automatically puts power to all 4 wheels.
- **Precision, 2-pedal brakes**—left brake neutralizes the transmission as it stops the machine... throwing all power to hydraulic system. This gives superior loading action in tough material. Right brake leaves the transmission engaged for full control of the machine when creeping or working on slopes.
- **Safe operation**—bucket lift arms and pivot points are completely in front of operator's area. This allows freedom of movement and wide visibility. Steps offer easy access. No need to climb over tires or bucket mechanism. Fenders protect operator from mud and stones... provide handy platform for checking engine.
- **Extra long reach**— $50\frac{3}{4}$ " at 7' dumping height—for faster, more accurate loading.
- **Choice of two new engines**—whatever your job or fuel requirement there's a No. 944 powered to meet the need. Diesel engine is compact, 4-cylinder turbocharged for maximum efficiency. Or there's a 6-cylinder gas engine.
- **105 HP***—delivered from either engine. Plenty of power for machine drive and hydraulic system.
- **4 speeds forward**—0-24 MPH.
- **4 speeds in reverse**—0-30 MPH. Reverse speeds are 25% faster than forward speeds to reduce cycle time.
- **Automatic kick-out devices** on bucket control levers—the lift control releases at dumping height. Tilt control positions the bucket for digging.
- **Accessible controls**—forward-reverse lever is located on steering column. Bucket controls are at the operator's right hand. Speed range selector and work-travel lever are on the operator's left... within easy reach. The No. 944 has push-button starting.
- **Full line of attachments available**—including forks, cab, special buckets, and the exclusive Caterpillar Side Dump Bucket that gives added efficiency... speeds cycle time.

*For comparative purposes, the maximum rating of the diesel engine is 135 horsepower.

Add 'em up. All of these features are designed to give fast, easy, safe operation. Add bold new design, sound engineering, quality construction, responsible parts and service coverage. All of these make the No. 944 Traxcavator pay off big on any wheel loader operation. See your Caterpillar Dealer. Ask for a demonstration. Compare the No. 944 with other loaders you've seen. Then you'll discover why this machine has all the bonus features and performance potential to bring new standards to wheel loader operation *on your job*.

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

CATERPILLAR

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A GREAT
NEW PRODUCT IN THE
CATERPILLAR TRADITION

THE MOST USEFUL PUBLICATION FOR CITIES, COUNTIES AND STATE GOVERNMENTS

NOVEMBER, 1960 • Volume 91, Number 11

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WALTER A. SCHEIBER			

EDITORIAL DEPARTMENT

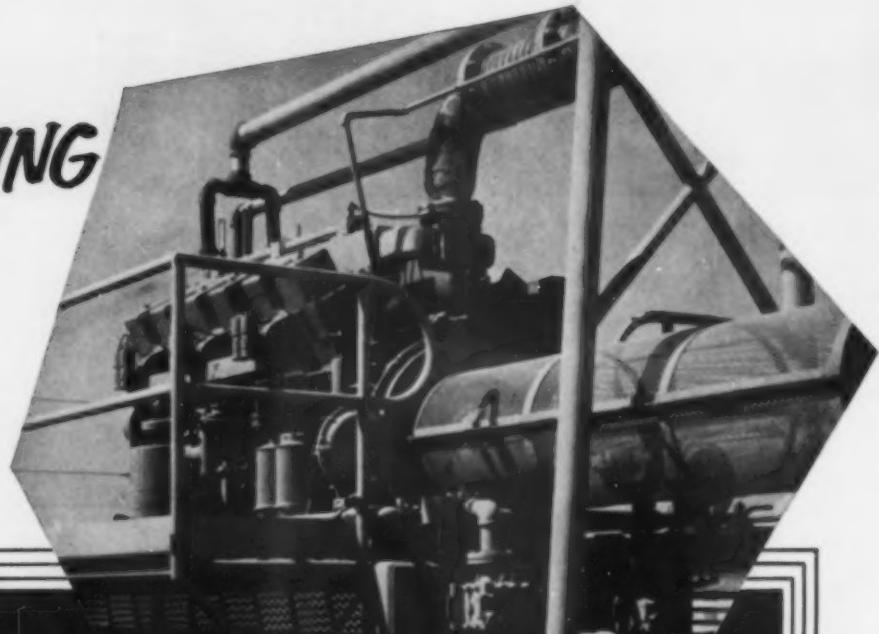
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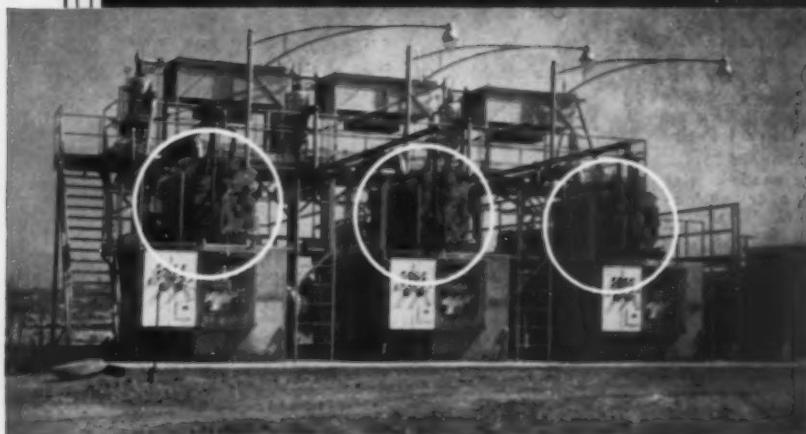
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PROTECTING

outfall
basin
fluid
level



three **CLIMAX** V-122
ENGINES
power outfall booster pumps



At Orange County, California, Sanitation District, Plant 2, three Johnson vertical flow centrifugal type outfall booster pumps are powered by three V-122 Climax 3232 cu. in. engines: 12-cyl., 60° V-type, 7" bore x 7" stroke. Engines are equipped with ebullient cooling, full automatic starting and speed regulation; burn sludge gas, with natural gas for standby, and drive through Western BSV-144 right angle gears, ratio 2.1304:1.

In the Orange County treatment plant, ordinarily the treated sewage flows by gravity from the plant through a 3000 ft. long outfall conduit to the ocean. But an increased inflow to the plant, or a high tide, or a combination of both, causes the outfall forebay fluid level to rise. At a predetermined point Pump Unit No. 1 starts, warms up, then goes on the line. Further increases in fluid level bring Pump Units No. 2 and No. 3 into action, when necessary. The three Climax

Engine powered Pump Units can handle maximum flow at the highest tide, and then some. With a decrease in outfall forebay level, the operation reverses—the units dropping off as need diminishes. For sewage treatment plants—seven rugged Climax Engine models . . . 12, 8, and 6 cylinders, burning sludge gas, or capable of operation on natural gas, butane, gasoline, or any combination . . . ranging from 100 hp to over 600 hp. Write for engine bulletins.

CL-118

CLIMAX ENGINE MANUFACTURING CO. • DIVISION OF WAUKESHA MOTOR COMPANY
FACTORY—CLINTON, IOWA



THE
EDITOR'S

POINT OF VIEW

New Problems of the Environment

OVER MANY years recognized factors in the environment affecting health have been relatively simple and few in number. Now conditions have changed. Pollution loading on streams, radioactivity, production of increasingly complex chemicals and the use of pesticides, to mention a few factors, have created serious problems. There have been indications that synergistic action can take place, resulting in compounds that can seriously affect health though the original components do not. The old concept of environmental sanitation must be revised. The new approach demands a working organization which will abolish previous compartmentation of effort and will substitute a broad consideration of all factors. Research and study will be necessary to determine and evaluate these newer health hazards and to develop policies for overcoming them. The scope of the needed work demands an early start, the employment of all presently available skills and perhaps the development of new skills.

The Progress of Professionalism

IN OUR dynamic and complex society, the progress of technology must be matched by the progress of engineering professionalism, if the integrity and stature of the engineer are to remain unquestioned. An example of such progress is the recent policy position adopted by the American Society of Civil Engineers, wherein the photogrammetrist was recognized as a segment of the civil engineering profession and accepted, with licensing requirements met, as a member of the professional family.

Such acceptance is essentially a recognition of new and greater responsibility by both the professional photogrammetrist and by his brother engineer whom he is trained to serve. Services, hereafter, must be solicited and offered on a negotiated—rather than a competitively bid—basis, with qualifications and experience of the photogrammetrist given foremost consideration by the engineer in the awarding agency; complete and accurate service to the client the prime concern of the professional photogrammetrist.

Immediate and wholehearted acceptance of this newest member of the profession will assure the continued progress of the engineer and the society he is dedicated to serve.

Designing Small Sewage Treatment Plants

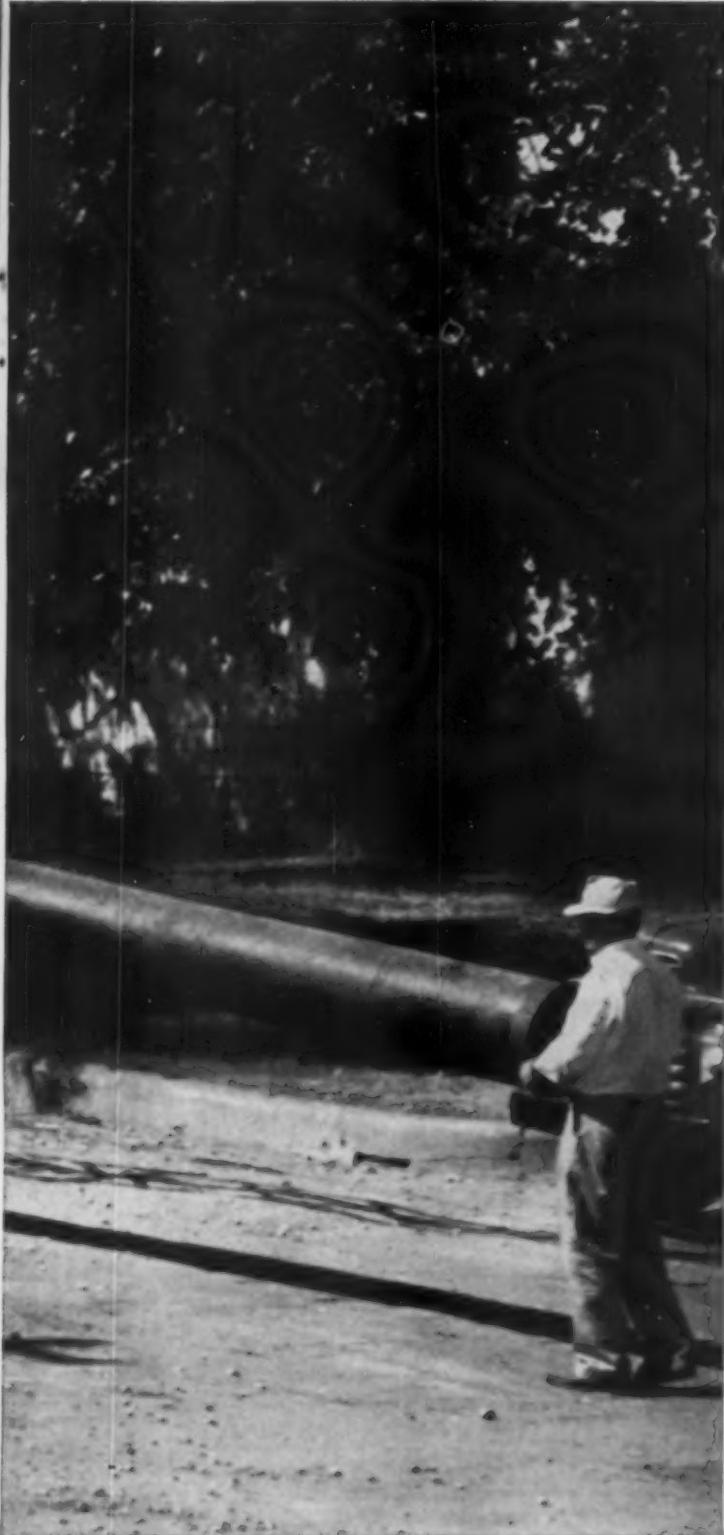
A RECENT release from a State Sanitary Water Board listed approvals for 15 sewage treatment plants. Of these, two were for 100 persons or less; seven were for more than 100 but not more than 500 persons; and the other six were for projects exceeding 500 but not exceeding 1,500 persons. This great preponderance of small plants is, we believe, typical of today's trends or at least is indicative of what will happen as more state agencies quit fooling around and actually require plants to be built. It emphasizes the need for excellent design and good equipment for small plants. Whether a sewage treatment plant is large or small, it costs money; and if the plant does not perform its duty the money is wasted. And in this connection, it seems about time that more states provided an adequate supervisory, counseling and training service to insure that plants are operated effectively. There are billions of dollars invested in waste treatment facilities and the only return that can be expected is treatment. Every effort ought to be made to insure this return.

Most of the above applies also to the so-called package plants; and these have an added advantage in respect to operation in that, being of standard design, training in operation is facilitated.

Getting Better Equipment for Public Works

MANY OF OUR counties and cities, and even some of our states, lack enough good, modern reliable equipment to perform promptly and economically the work they have to do. There is ample supply of used equipment available but, speaking broadly, it cannot be purchased from public funds. The reason is that no one can write a satisfactory purchase specification for used equipment. However, there is no reason why counties and cities cannot rent equipment of a modern type. The numerous suppliers of first class equipment usually have service facilities that will insure satisfactory results from rebuilt machinery; and, anyway, when it breaks down or otherwise fails to operate, no rental should be involved. There may be state or local laws limiting the gross payment for rental, especially for one piece of equipment, but this generally will represent no serious bar to use. A trial lasting only a week or two may readily demonstrate the savings possible with modern equipment; and, in such cases, a good basis is established for purchasing.





GOES TO BED WITH ITS WORKING CLOTHES ON

From the moment it is installed, cast iron pipe begins working—will deliver its full flow of water for over a century.

Here in Kansas, as part of a major water expansion program, 15,000 feet of cast iron pipe were put to bed. Ease of assembly, bottle-tight joints, and assured full-flow capacity through cement lining were important factors in the selection of cast iron pipe.

An interesting feature was the uncovering of distribution mains constructed of cast iron pipe manufactured in 1887. The pipe was in excellent condition and was put back in water service.

Cast iron pipe is always working. In fact, once it is installed, one can generally anticipate no major repairs or replacements for at least a century.

CAST IRON PIPE RESEARCH ASSOCIATION.
Thos. F. Wolfe, Managing Director,
3440 Prudential Plaza, Chicago 1, Illinois



CAST IRON PIPE
THE MARK OF THE 100-YEAR PIPE

More work out of trucks ... at Lower Cost?

**EATON 2-SPEED AXLES
WILL DO IT!**



On-the-job performance records prove that trucks equipped with Eaton 2-Speed Axles make quicker trips, travel more miles at lower cost per mile. By providing double the conventional number of gear ratios—the right gear ratio for every road and load—they reduce stress and wear on engine and power transmitting parts; permit engines to run efficiently under all operating conditions.

Eaton's exclusive features, including forced-flow lubrication, planetary gearing, and Inductalloy Axle Shafts, add thousands of miles to axle life, and eliminate costly maintenance expense worries.

Ask your dealer to explain how Eaton 2-Speed Axles reduce hauling costs, add to profits, and make trucks worth more on the trade-in.

**EATON
2-SPEED
AXLES**



More than 2 Million Eaton
Axles in Trucks Today

EATON

— AXLE DIVISION —
MANUFACTURING COMPANY
CLEVELAND 10, OHIO

NEW!

MUELLER®

COPPER METER YOKE

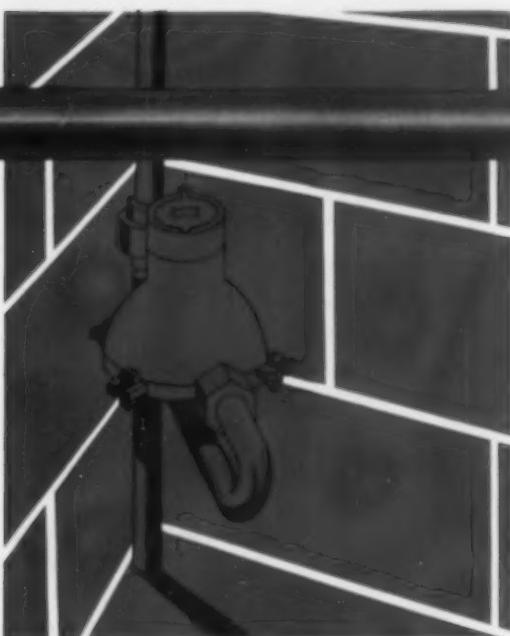
... for tight corner settings!



■ This new copper yoke now lets you set the meter in basement or utility room corners where the piping is too close to the walls to install regular yokes. Meters can be properly set at a convenient height for easy reading and servicing. The sturdy design rigidly supports the house piping and protects the meter from piping stresses.

Installation is fast, too! Convenient union connections for installing yoke in steel pipe or compression couplings for installing in new or existing copper pipe. No other fittings are needed.

Compression couplings with locking nut positively insure continuous electrical bonding of the piping.



**two models
available:**

for $\frac{5}{8}$ " x $\frac{3}{4}$ " meters:

- for $\frac{3}{4}$ " steel pipe
H-14811 — Copper Meter Yoke with $\frac{3}{8}$ " inside I.P. thread union connections on inlet and outlet.

- for $\frac{3}{4}$ " copper pipe
H-14815 — Copper Meter Yoke with compression couplings (regular or locking nut type) on inlet and outlet.

Write for complete information.



**MUELLER CO.
DECATUR, ILL.**

Factories at: Decatur, Chattanooga, Los Angeles;
In Canada: Mueller, Limited, Sarnia, Ontario

New from Westinghouse



high intensity
OV-50 mercury
luminaire
distributes more
light over
wide roadways



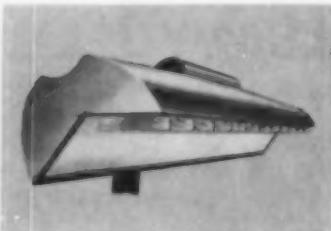
You need high-level lighting where traffic is heavier and faster and roadways are wider. Here's why the new Westinghouse OV-50 mercury luminaire is your best bet.

This good-looking unit, with external ballast, takes 700- and 1000-watt mercury lamps, clear or color improved. Boosting illumination intensities can be just a matter of changing lamps. And you get more light because a scientifically designed optical system directs a major portion of this extra light to the roadway surface where it is needed most.

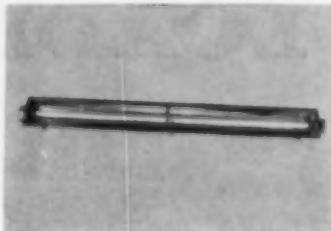
Maintenance is minimized, too. With the new OV-50, the optical system is completely sealed—no dust, moisture or bugs can get inside. The die-cast aluminum housing has an attractive "hammer-tone" silver aluminum, baked enamel finish that's highly resistant to heat, abrasion and corrosion. The OV-50 fits standard poles and brackets, or davit poles with a minimum 7½-inch pipe tenon. Find out more about the OV-50 with either internal or external ballast. Contact your nearby Westinghouse representative or write Westinghouse Lighting Division, Edgewater Park, Cleveland, Ohio. Remember—you can be sure . . . if it's Westinghouse.

J-04478

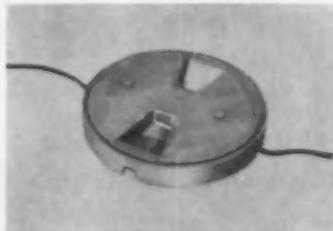
Westinghouse



NEW WESTINGHOUSE FAN-COOLED, FOUR-LAMP "MAINSTREETER" gives you the benefits, prestige of fluorescent roadway lighting . . . economically. Designed to be located at the curb and mounted parallel to it, the trim "Mainstreeter" keeps dangerous glare out of drivers' eyes. Four fluorescent lamps, coupled with special reflector and refractor, mean more light more uniformly distributed (coefficient of utilization is often as much as 50% higher). A cooling system is thermostatically controlled to provide lamp cooling when needed.



NEW WESTINGHOUSE SIGN-PAK: Roadway directional signs, competing with adjacent illumination, must stand out if fast-moving drivers are to get the message. Answer: the exclusive Westinghouse Sign-Pak, incorporating two high-efficiency Sataliner reflector assemblies; in-line ballast compartments (with ballast); and extra-long leads. Completely prewired, preassembled for easy installation. And since Sign-Pak directs light upward from the sign bottom, the light can't bother drivers.



NEW WESTINGHOUSE RUNWAY LIGHT: Westinghouse makes a complete line of airport lighting and control equipment. This latest addition is the new inset light which solves the approach and landing problem of the jet-age aircraft. Utilizing a small, 45-watt quartz-iodine lamp, this rugged, disc-shaped unit mounts flush to, or no more than $\frac{1}{8}$ inch above, the runway surface. Result: safer jet landings because of the nonblinding strips of light, visible under all weather conditions.



ONLY LOADER WITH...

You shift from any one gear to any other—forward or reverse...on-the-go. Allis-Chalmers tractor loaders make fast work far easier for any operator.

It's simple for a tractor loader operator to work faster—get more done. It's just as easy for him to go into a high gear as into a low gear—forward or reverse. ONE LEVER controls both speed and direction. No fumbling around with two or more levers or a combination of levers and foot pedals.

Besides operating simplicity, a tractor loader has *firmly connected axles*—attached to frame with 2-inch diameter steel pins . . . no rolling and shifting under load. *Extra stability* lets operators get and deliver

move ahead with



. SINGLE-LEVER SHIFT

bigger loads with greater comfort. Add extra reach for fast, even dumping and you can see why production is higher with an Allis-Chalmers tractor loader. Let your dealer show you. Allis-Chalmers, Construction Machinery Division, Milwaukee 1, Wisconsin.

The "Big Three" tractor loaders range in size from the TL-14 with 5,300-lb carry capacity to the TL-20 (shown) with 9,000-lb carry. Each has a family of buckets—18 bucket loader combinations in all.



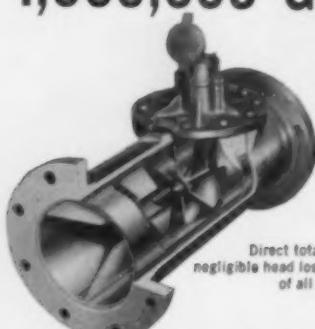
ALLIS-CHALMERS 
... power for a growing world



MORE THAN 30,000 INSTALLATIONS

*Sparling Main-Line
in
U.S. towns and cities*

*providing totalization
of varied flows from
30 GPM
to
1,500,000 GPM*



Direct totalization and accuracy with negligible head loss are outstanding features of all Sparling Main-line meters.

More than 30,000 Sparling Main-line meter installations are serving American towns and cities every day, with thousands more in use throughout 29 foreign countries. Applications vary from single 2-inch meters for minimal requirements to multiple 19-foot installations that handle flows in excess of 1½ million gallons per minute...universal proof that wherever, or whatever, the need for Main-line metering you can specify, and depend on, Sparling.

Sparling is the pioneer propeller meter. For nearly half a century Sparling equipment has been serving the waterworks field with high performance meters, recording instruments, and controls. Let Sparling serve you, too. Write for Catalog #315, or call your local Sparling field engineer.

 **SPARLING**
WATER CONTROL EQUIPMENT

HERSEY-SPARLING
METER COMPANY

Sparling Equipment: **EL MONTE, CALIF.**
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FLEET DRIVERS REPORT ON '61 LARK PERFORMANCE

"Immediate response to acceleration"

"Good hill climbing"

"Very little steering effort on twisting mountain roads"

"Good solid feeling...no squeaks or rattles"

"Excellent maneuverability and directional stability"

"Easy to get in and out of"

"Good headroom"

"Parks easily"

"Good in traffic, and stop-and-start driving"

MILEAGE 22% BETTER—OIL CONSUMPTION ZERO

Certified by United States Testing Company



THE '61 LARK[®]
BY STUDEBAKER

PS: *The best trucks for your business are built by Studebaker—½ to 2 Tons heavy duty!*

These are actual comments from men who drove the '61 Lark in four large blue-chip fleets. They averaged 148 miles per man, on their regular routes.

Their reports cover the new 112 HP Skybolt Six engine (20-25% better mileage), new suspension and steering (30% easier), new bonded brakes (up to 100% longer wear). But there are over 50 improvements in all contributing to '61 Lark *Performability*. You have to drive it to believe it!

GET THE FULL STORY ON FLEET SAVINGS!

Fleet Sales Division, Studebaker-Packard Corporation, South Bend 27, Ind.

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Have a factory representative call me for an appointment

NAME _____ PLEASE PRINT _____

TITLE _____

COMPANY _____

ADDRESS _____

PW11-60-F3

CUT 20" CAST IRON PIPE in Less Than 8 Minutes...



...with the New REED ROTARY CUTTERS

(4 sizes cover the range from 10" cast iron to 24" steel pipe)

These one-man Reed Rotary Cutters cut large diameter steel or cast iron pipe faster and better than the heaviest power machines . . . and without electrical or explosive hazards. What's more, there's less digging in ditch-work! You need only a 4" to 6" channel under the pipe and a 45° to 60° arc for the handle swing. Reed Rotaries are easy to "carry in", too. The 20" size weighs only 68 pounds; separates into 3 easily carried parts. Patented pipe guide assures clean, right-angle cuts. Four razor blade wheels track perfectly, cut easily and are quickly interchangeable for steel or cast iron pipe.

- Write today for descriptive literature.

These typical cuts on 12, 16, 20 and 24" cast iron pipe illustrate the clean, accurate, right-angle cuts provided by Reed Rotary Cutters.



REED MANUFACTURING COMPANY
ERIE • PENNSYLVANIA



Roy W. Morse, who has just received an award as one of the ten "Public Works Men-of-the-Year" (see page 118), sponsored by the American Public Works Association, is City Engineer of Seattle, Wash. He has held this position, and that of Chairman of the Board of Public Works, since early in 1957. Prior to that he was Superintendent of Water, starting in 1949. From 1955 to 1957 he was Director of the Technical Review Staff of the Department of the Interior and was responsible for the preparation of the 1955 Report on Water Resources Policy.

One of the large projects on which Mr. Morse has been engaged is the Tolt River water supply system which is designed to provide Seattle with an ample supply of water for the foreseeable future. This \$22 million project consists of a storage dam and reservoir, with a 23-mile pipe line to the city system. Ultimately, it can supply 180 mgd.

Another large project, the \$10½ million widening and improvement of a major north-south arterial is shown as a background for the front cover picture.

The Board of Public Works, of which he is chairman, approves plans and lets contracts annually for municipal improvements aggregating some \$20 million per year. As City Engineer, he is responsible for the design, construction and maintenance of all public works in the city.

He is a member of ASCE, AWWA, and the Washington Society of Professional Engineers and is a Director of the APWA. He and Mrs. Morse have two daughters. The family recreation involves gardening and skiing. He has participated in many community activities and is currently serving on the Executive Board of the Seattle Council of Churches.



Why this "magnetic" meter attracts more revenue

Since Rockwell first introduced the Sealed Register meter, the center of attraction has been its magnetic drive. But this magnetic principle does a lot more than attract the eye. It attracts more revenue, especially at low flows. That's because there is no friction from a conventional stuffing box, gear train, driving dog or register—all of which cause a drag on the measuring chamber.

This meter attracts substantial savings in maintenance, too, through having fewer parts—only two of

which operate in water.

Another big attraction is the hermetically sealed register which cannot fog or become dirt encrusted—hence is always easy to read.

Now you can get these "magnetic" meters in a complete range of sizes from $\frac{1}{2}$ " through 2". In any size, or for any service, these meters will attract more revenue to you. Write for catalog. Rockwell Manufacturing Co., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Company of Canada, Ltd., Guelph, Ontario.



SEALED REGISTER METERS

another fine product by

ROCKWELL

Quality costs less in the long run!

BJ Vertical Circulating Pumps

Designed to deliver water in large volume, BJ Vertical Circulating Pumps are in use on some of the Nation's largest industrial and governmental projects.

These BJ Quality Pumps are ideal for cooling tower circulation, irrigation service, flood control projects, municipal primary water pumping, river intake, dewatering for large construction, condenser circulation, industrial processing and other big jobs which demand the economy of long, reliable service.

Operating continuously with high efficiency, BJ Circulating Pumps are self-priming and require only a simple installation. Available in capacities to 50,000 GPM in standard models, and beyond on special order!

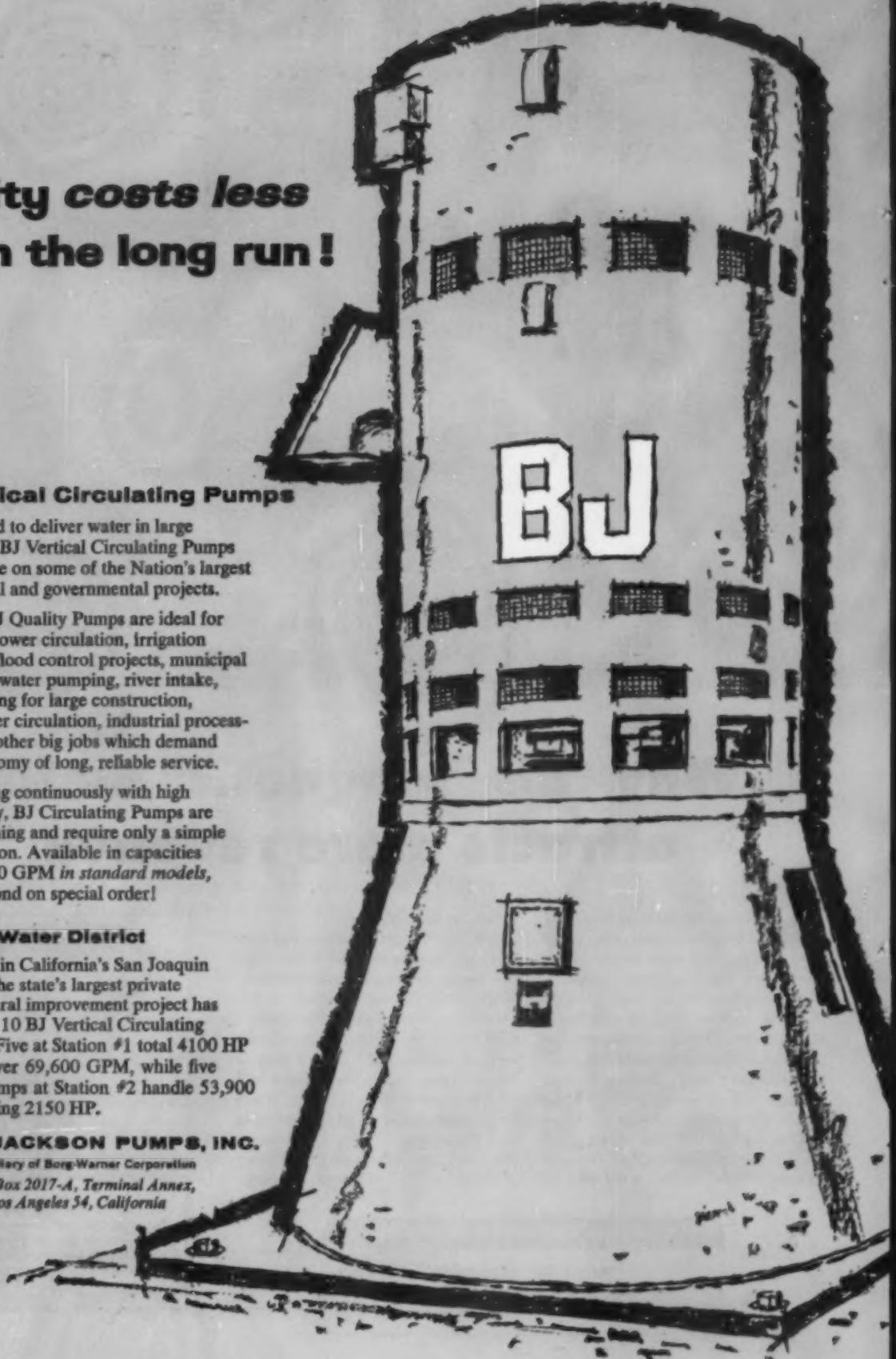
San Luis Water District

Located in California's San Joaquin Valley, the state's largest private agricultural improvement project has installed 10 BJ Vertical Circulating Pumps. Five at Station #1 total 4100 HP and deliver 69,600 GPM, while five more pumps at Station #2 handle 53,900 GPM using 2150 HP.

BYRON JACKSON PUMPS, INC.

Subsidiary of Borg-Warner Corporation
P.O. Box 2017-A, Terminal Annex,
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**Helping to keep
a river clean...**

HAMILTON KENT
TYLOX
Rubber
PIPE GASKETS

**PREVENT JOINT LEAKS, WHIP CORROSION AND SPEED
PIPE WORK ON SEWER PROJECT AT OIL CITY, PA.***

Oil Creek, a watercourse in Oil City, Pa., will be cleaner, purer, and an even greater enhancement to the beauty of the city, as a result of current work being done under Oil City's continuing sewer expansion program. Consisting of several miles of new laterals, new concrete pipe interceptors up to 36" in diameter, and a new sewage treatment plant, the facilities now being added make it possible to treat all sewage waste disposal before effluent is discharged into the river.

Engineers and officials specified Hamilton Kent TYLOX Rubber Gaskets for coupling the pipe lines, knowing they could count on TYLOX for three important advantages: leak-proof joints to keep infiltration loads negligible at the new plant; acid-resistance to prevent deterioration of the joints and necessity of future repairs; and easier, faster pipe coupling, to help keep construction costs down.

**WRITE FOR ENGINEERING DETAILS ON TYLOX—
Specify TYLOX FOR YOUR PIPE PROJECTS**

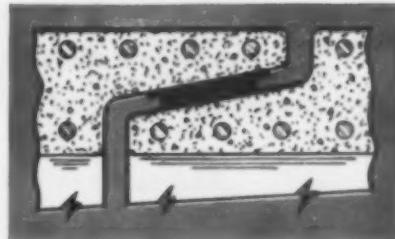
* PROJECT: Sanitary sewer expansion, Oil City, Pa.

ENGINEERS: Morris Knowles, Inc., Consultants, Pittsburgh, Pa.,
R. B. Fleming, Resident Engineer.

CONTRACTOR: Ben Construction Co., Pittsburgh, Pa.

PIPE: Reinforced concrete, manufactured by Concrete Pipe Co.
of Ohio, Cleveland, Ohio.

NORTHWEST: Seattle 1, Wash., MUtual 2-7667



TYLOX Gaskets form a permanently tight compression seal. Water can't leak in or out... roots and sediment can't penetrate... acids can't destroy. Pipe can be coupled in wet trenches... backfill may be applied immediately.

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Another city such as Spokane, Dallas, or Los Angeles will soon be enjoying the savings of another rehabilitated pipe line. The flow will increase, the pumping cost will drop and the pipe line will be good as new for at least another quarter of a century.

And traffic will move without interruption or inconvenience to the public.

Spunline® is applicable to pipe lines down to 4" and may be used in cast iron, steel, concrete and wrought iron pipe lines.

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SEWAGE AND WATER CONSTRUCTION

The contract awards for water and sewage works are analyzed for 1959. The totals are \$349.2 million for sewage treatment, \$335.8 for collecting sewers and \$503.9 million for water works. The amounts spent in these respective categories are broken down by month, by state, by population groups and by drainage basins. A further analysis is made of contracts awarded for new plants as compared with additions. This bulletin is identified as Public Health Service Publication No. 758 and may be obtained from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C. at a price of 20 cents.

HYDRAULICS OF BRIDGE WATERWAYS

The Bureau of Public Roads, U. S. Department of Commerce, has published a new bulletin, Hydraulics of Bridge Waterways, the first of a proposed series on hydraulic design of highway drainage structures. The 53-page illustrated publication is available from the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C., at 40 cents per copy.

This text presents simplified methods for computing backwater caused by bridges. These were developed from extensive model tests and checked against actual measurements at bridge approaches. The empirical curves and methods of calculation have been subjected to broad field use during the past few years.

Chapter titles include: Computation of backwater; extent of backwater; difference in level across approach embankments; dual bridges; abnormal stage-discharge condition; effect of scour on backwater; illustrative problems; and limitations of data.

WRI BUILDING DESIGN HANDBOOK

This 168-page handbook is divided into two parts. The first part consists essentially of general text



CLEVELAND DIGS SHALE AND ROCK 3-5 FT. DEEP FOR HIGHWAY DRAINAGE

THE JOB: 20 miles of drainage trenching in both inner and outer shoulders of five miles of dual highway for the relocation of U. S. Route 25 near Middletown, Ohio.

CONDITIONS: trench to be cut to grade, 18 inches wide, 3 or 5 feet deep depending on inner or outer shoulder, through very densely compacted shale and rocky material, further densified because much of the grade carried hauling equipment all through a winter, spring and summer.

PERFORMANCE: despite need to replace worn bucket teeth more frequently than usual because of the tough digging, a Cleveland J-40 dug the trench to accurate grade at the rate of 1,800 to 2,000 feet per 9 hour day.



WRITE TODAY for Bulletin L-110,
a detailed report on the performance
of the J-40 on this tough
highway drainage job.



CLEVELAND TRENCHER

THE CLEVELAND TRENCHER CO., 20100 ST. CLAIR AVE., CLEVELAND 17, OHIO

PUBLIC WORKS for November, 1960

machine: in June 1959 we purchased a Vermeer Pow-R-Stump Cutter.



Stump Removal

... wins public good will and adds beauty to Appleton, Wis.
By EDWIN DUSZYNSKI,
Director of Public Works

Appleton, with a population of about 80,000, instituted a stump-removal program strictly as a public-relations activity. During the first four months of operation, July through October 1958, two things happened. First, the handled properly, the benefits of removing stumps can be accomplished quickly, satisfactorily and economically. Secondly, the results in public good will and better-appearing streets is well worth the small cost involved. Other benefits add to the program's value.

For many years the Public Works Department did offer some assistance to property owners faced with the problem of removing stumps along the parkway or boulevard line between the street curb and sidewalk. This consisted of digging out the stump and hauling it away after the property owner had excavated around and under the

* Mr. Duszynski has served as Director of Public Works for the City of Appleton since 1954 and prior to that held the same position in Cedar Rapids, Ia.

stump and cut enough of the roots for easy removal. We made no charge for this service.

Over the last many years in the parkway had been cut down for various reasons. In most cases the chain saw had been used, with the cut made as close to the ground as possible. Only a few people undertook the task of digging out the remaining stump. Others resorted to whacking away at the stump with an ax, burning it from the top down, or drilling holes in the stump and applying chemicals to accelerate dissolution. Seldom did these methods result in a satisfactory job, and in most cases the stump was left intact to mar the appearance of the parkway.

Alderman Investigates

In view of the interest of about ten property owners in improving the parkway strip, which is a part of the street right-of-way, several aldermen felt that the city should take action on the subject. The expenditure of city funds would be justified in that the work would be on city property.

Research revealed that others had tried many methods of stump removal equipment. But a Vermeer stump cutter showed the most

promise. On a trial basis we hired two retired city employees of an adjacent city who owned such a machine and were engaged in the stone-cutter business. These men agreed to work on several tree stumps while several aldermen watched the operation. At the next budget time, these aldermen provided the impetus to include

the purchase of a Vermeer Pow-R-Stump Cutter.

The machine consists of cutting a stump ten inches below the level surface on which the tires rest. A larger machine is available that will cut 18 inches below grade. With either machine the cut is made at ground grade.

It can be extended by excavating around the stump to permit the machine's wheels to be placed at a lower elevation.

The unit, mounted on two pneumatic tires, contains a prime mover of an air-cooled gasoline engine supplying power to operate a cutting pump and hydraulic pump.

The pump provides pressure to the

wheel either horizontally or vertically.

We use a Willys Jeep to tow

and pictures describing the ways in which steel wire fabric is put to effective use. Tables, sketches and detail drawings are included to help the design engineer and his draftsmen.

The second part deals primarily with the use of heavy welded wire fabric, and, being principally a series of actual design tables with necessary explanatory text, is a working tool for actual design. Several illustrative design problems are included.

Heavy fabric, with members in both directions up to $\frac{1}{2}$ inch in diameter, permits use of prefabricated sheets of wire reinforcement to counteract stress in two directions. In part 2 are tables for one-way slab design, with spans from $10\frac{1}{2}$ to 21 feet. The handbook is available without charge to all bona fide inquirers, requesting it on an organization letterhead. Dept. BH-70, Wire Reinforcement Institute, 1049 National Press Building, Washington 4, D. C.

FLOOD PROOFING

One of the several available adjustments to mitigate flood losses is flood proofing. This adjustment consists of measures to render building, contents, and grounds less vulnerable to flood. There may be 21 different elements in a flood proofing program. A few examples are: coatings to prevent seepage, cut off valves on sewer lines and bulkheads to prevent the entry of flood waters through doors and windows.

Flood proofing has been given consideration in a few instances, but the possibilities of its use have never been fully explored. This report analyzes the advantages and disadvantages or limitations of the approach giving consideration to examples of flood proofing in Pittsburgh, Pa., and Wheeling, W. Va.; and utilizing Bristol, Virginia-Tennessee as a case study to assay its economic feasibility.

Flood proofing appears to be more effective in areas of intensive industrial and commercial uses than in residential and agricultural sections. Flood-proofing can be used separately or in conjunction with flood control projects, flood-plain regulations, and flood insurance in order to mitigate flood losses. It seems unlikely to be used without regard to other measures, but it promises some substantial gains.

By John R. Sheaffer. The University of Chicago, Department of Geography Research Paper #65, 198 pp., 25 illustrations, 1960, \$4.00.

Thanks, Mr. Duszynski!

Mr. Edwin Duszynski, Director of Public Works in Appleton, Wisconsin, tells of his experience with the Vermeer Pow-R-Stump Cutter in the above article from the June issue of American City Magazine. "The most economical method of stump removal I know of," is the way he describes the action of the powerful model 10 Pow-R-Stump Cutter. This is just one of hundreds of outstanding recommendations received each year from cities, parks, golf courses, cemeteries and tree service firms all over the country.

PATENTED VERMEER POW-R-STUMP CUTTER MAKES CHIPS OUT OF STUMPS IN MINUTES

You'll save hundreds of man-hours and thousands of dollars annually when you remove ugly stumps with the Pow-R-Stump Cutter. Removes any size stump in minutes. It is an easy one-man operated unit. Allows close quarter cutting to sidewalks, buildings, curbs and driveways without damage. There's ONLY ONE POW-R-STUMP CUTTER... ask for a FREE demonstration. (Registered under U.S. Patent No. 2912022.)

MAIL COUPON FOR COMPLETE ILLUSTRATED LITERATURE AND LOW PRICES NOW

Send complete descriptive literature and prices on your POW-R-STUMP CUTTER to:

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Public safety is the basic reason for salting streets and highways. Morton Safe-T-Salt* is a product named to explain this function to the public. Morton Safe-T-Salt makes your job easier because it constantly reminds the public of the primary reason for salting treacherous pavements and helps promote what you do to reduce the hazards of winter driving.

Designed to meet your specifications, Morton Safe-T-Salt is a screened, graded, economical rock salt that makes your streets and highways safer by ridding them of dangerous ice and

packed snow—quickly and thoroughly. Morton Safe-T-Salt gives *immediate abrasive traction* against skidding, *penetrates deep ice* and *quickly melts* the bond between ice and street surface. **Safe, clean, economical**—Non-toxic and easy to handle, straight Morton Safe-T-Salt will not clog sewers or leave a rutted dirty pavement as will sand and cinders. Moreover, rock salt *melts more ice at lower cost* at any temperature above 8° F. than any other commonly used ice melting chemical or abrasive.

Available in bulk or 100-lb. bags, Morton

Safety-T-Salt also is ideal for stabilizing roads. So order enough now for your winter ice and snow control program. Any Morton Safe-T-Salt left over can be used in your summer road stabilization projects.

*Safe-T-Salt is a trademark of the Morton Salt Company

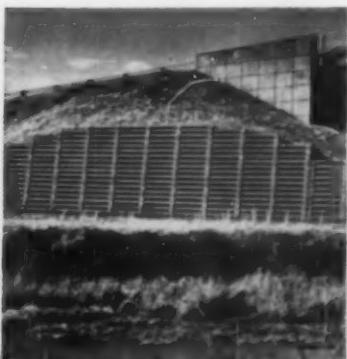
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SUPERINTENDENT
Should Know
About**



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BY FACTORY TRAINED REPRESENTATIVES

American Waters Meters are backed by the kind of service that only factory trained representatives with many years of experience in water works operations can render. Whether it's a problem of meter selection or a mechanical question in the repair department, you will find American Meter representatives extremely cooperative and well prepared to give helpful information or practical instructions. To the service man, they will be glad to demonstrate time-saving methods

that reduce costs and maintain meter accuracy.

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American Meters. They are ready to give expert help to any water works superintendent whenever needed.

Complete information on the many cost saving features of American Meters are contained in Bulletin 58. A copy will be gladly mailed to you on request.



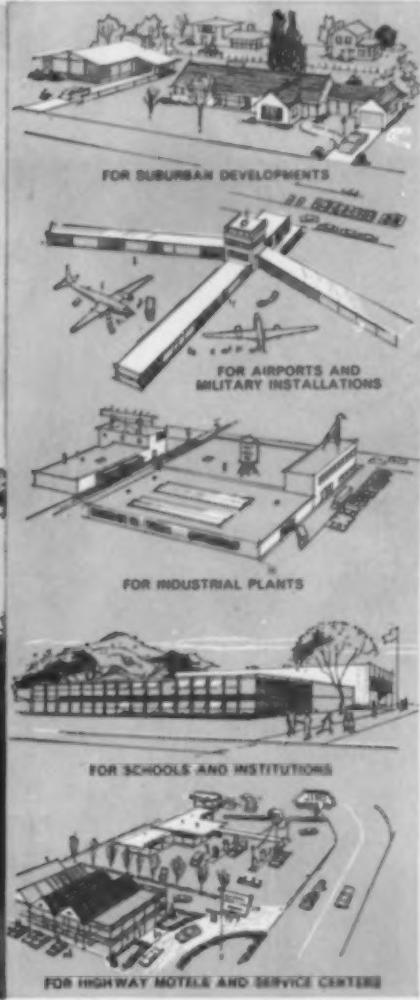
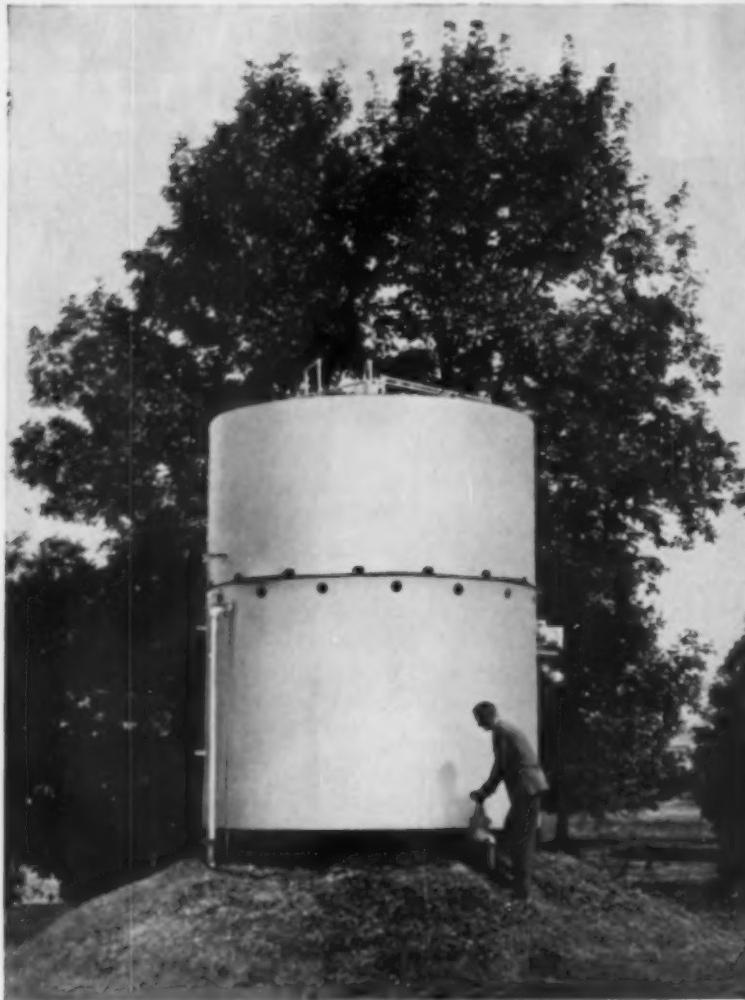
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INCORPORATED

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"Big-city" sewage processing
for small-capacity needs...
all in one low-cost unit



BIO-PAC

single-unit sewage treatment

Here's the economical answer to sewage problems brought on by population spread and by antipollution regulations which are obsoleting old-fashioned methods of sewage disposal in outlying areas.

Bio-Pac is available in capacities to serve 50 to 500 people, and is designed to operate efficiently in areas remote from metropolitan sewage service. It is a scaled-down version of two-stage, large-capacity bio-filtration plants that serve major cities, and it meets the Ten States Standards for sewage works.

Easy single-unit installation is accompanied by low-cost operation—can effectively handle "shock loads" with no need for technically skilled maintenance personnel. And compact design lends itself to "hide-away" landscaping.

Link-Belt will work with your consulting engineer or architect to find out how Bio-Pac can best serve you. Write LINK-BELT COMPANY, Dept. AV, Prudential Plaza, Chicago 1, Ill. Ask for Folder 2971.

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SHOW ON
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1961 CHEVROLET STURDI-BILT TRUCKS! PROVED WORTH MORE BECAUSE THEY WORK MORE

A gigantic advance in trucking began just a year ago, when the first Torsion-Spring Chevy nosed out onto a highway. With a vastly different truck design, featuring torsion-bar independent suspension, this totally new Chevy did just about everything better. And it caught on fast. So fast, in fact, that already there are nearly 300,000 Torsion-Spring Chevies putting out this new kind of working ability on tough jobs all over America. Now, for 1961, Chevrolet introduces trucks with even more of the worth-more, work-more performance that's won such wide owner acclaim over the past year. Even more strength, even more stamina—and an even wider range of models!

MORE MODELS THAN EVER BEFORE! 189 models—work-proved dollar savers in every weight class! 1961 Chevies for every hauling chore in the book include three new long-wheelbase 4-wheel drive models, sturdy Stepside and Fleetside pickups, spacious panels, versatile Suburban Carryalls, handy Step-Vans and forward control chassis, tough chassis-cabs of all sizes, mountain-moving tandems. Somewhere in this long, long line is the one truck that makes the most sense on your job!

OWNER-PROVED TORSION-SPRING RIDE! It puts an end to I-beam axle shimmy! Independently suspended front wheels step right over bumps, tough torsion-bar springs soak up jolts. New smoothness speeds up schedules, cuts truck wear and maintenance expense, reduces cargo damage and driver fatigue. Owners report that there's never been anything like it for high-profit hauling!

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rugged cab build includes all-steel construction, double-panel roof and double-walled cowl housing.

TOUGH TRUCK CHASSIS—BRAWNY BASIS FOR BIGGER PROFITS. Massive, truck-built frames add stamina to every chassis. In medium- and heavy-duty models, rugged self-adjusting variable-rate rear springs help smooth out big-tonnage hauls. Quality features galore boost truck life: Extra-big brakes give faster, surer stops and last longer. Precision wheel balance makes steering easier, lengthens tire life. Smooth, durable Synchromesh transmissions come in sizes to suit all types of duty.

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The truth is, we could fill every page in this magazine with reasons why Chevrolet trucks have never been better than they are for '61, but there's no need for that. Not when your Chevrolet dealer can boil it all down for you so quickly and pleasantly. See him soon and start saving soon! . . . Chevrolet Division of General Motors, Detroit 2, Michigan.



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Although Lock Joint Pipe Company has maintained its own research and testing laboratory for many years, the Company's growth and insistence on even higher quality products and improved manufacturing techniques have demanded the expansion of these facilities. For this reason it has erected a new research center featuring the latest equipment and staffed with scientists, engineers and trained technicians.

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opment Division, housed in this new half-million dollar center, stand guardian over the high quality of all present Lock Joint products and institute and evaluate future product developments. For it is the Company's firm conviction that only by strict quality control can its products' superiority be maintained . . . and that only through the development of even better materials and more efficient manufacturing techniques can Lock Joint retain its position at the head of its field.



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CHESTER TOWNSHIP located in Morrow County, Ohio, keeps its Huber-Warco 9-D motor grader busy cleaning out ditches, maintaining roads and plowing snow. Township officials like the performance of the grader and ease of operation.



HUBER-WARCO motor graders

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SMOOTH, FULL POWER NO MATTER WHAT THE LOAD—Huber-Warco motor graders offer a power train matched to any load condition. It puts more power to work—smoothly, efficiently and economically.

TORQUE CONVERTER—Automatic features eliminate engine lagging and heavy load shocks. Engine torque is multiplied three times to give fast, effortless starts even with heavy loads.

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The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

NEW LISTINGS

Portable Asphalt Surface Heater

39. . . may be operated by one man to apply concentrated heat to asphalt bumps and push-ups and to make the surface workable. Circular gives specifications for Models SH-15 and SH-20, available from Essick Mfg. Co., 1950 Santa Fe Ave., Los Angeles 21, Calif. Circle the reply card.

Package Plant Provides Big-City Sewage Treatment



40. With a design based on the "Ten State Standards," the Bio-Pac employs two-stage biofilters, primary and secondary settling and sludge digestion, all in a single corrosion protected steel shell. Design criteria for selecting appropriate sizes for residential, industrial plant, restaurant, motel and trailer court and school use are featured in Folder 2971. Also given are dimensions and installation data for 50 to 500 population equivalent plants. Write to Link-Belt Co., Colmar, Penn.

"Waste Is for Burning... Without Flame"

56. This is the title of a 24-page book, all about the application of the new Zimmermann process of sewage sludge disposal. It contains a detailed description of the process which reduces fresh sludge to ash and water by heat and pressure, taking the place of digestion, dewatering and incineration. Full design details are included on installations now being made plus photos and a multi-colored flow diagram. Circle the reply card or write for your copy, Zimmermann Process Div., Sterling Drug Inc., 1450 Broadway, New York 18, N. Y.

Buckhoe Attachments for Crane Excavators

59. The variety of attachments offers a wide choice of machines, allowing selection of tools for specific jobs including "V" buckets for pipeline and drainage ditch construction, blades for backfilling, "moles paw" for digging in clay and heavy duty rock buckets. 4-page Bulletin BH-60-1 describes the attachments and gives specifications and digging ranges. Write to Schield Bantam Co., Waverly, Ia. or circle the reply card.

How to Light that Playing Field

97. Nearly 100 lighting layouts are detailed in 72-page Bulletin 2721, for illuminating all types of play areas, from archery and badminton through volleyball and wrestling. Circle the reply card or write Crouse-Hinds Co., Syracuse 1, N. Y.

Light Hauling in and Around the Plant

98. . . is simplified with a Cushman 780 Truckster, a three-wheel, 7.95-hp., 72-in. wheel base truck equipped with flat bed body and stake racks. Write for bulletin containing specifications, Cushman Motors, Lincoln, Neb., or check the reply card.

What You Should Know About Venturi Tubes and Nozzles

105. Bulletin No. 100 contains a short description of the various types of Venturi tubes used for water, sewage or sludge service. This is a condensed bulletin which should be in the files of all consulting and designing engineers involved in water and sewage works design. Write Simplex Valve and Meter Co., 7 East Orange St., Lancaster, Pa. or check the reply card.

Rated Aeration Now Can Be Had in a Package

112. Chicago Pump's aerobic digestion sewage treatment plant is available as a factory assembled unit combining comminution, diffused-air aeration and settling for 1,000, 3,000, and 5,000 gpd loads. Write for bulletin on Rated Aeration SS, Chicago Pump, Food Machinery and Chemical Corp., 622 Diversey Parkway, Chicago 14, Ill., or check the reply card.

Why Sod or Plant?

113. . . when you can establish a grass area in 18 to 21 days merely by rolling it in place. TroyTurf carpets are preseeded and pre-fertilized and can be placed by hand or tractor on level areas or 85° slopes if desired. Write for TroyTurf bulletin, Troy Blanket Mills, 200 Madison Ave., New York 16, N. Y. or circle the reply card.

Mercury Vapor Luminaires Provide Greater Efficiency

126. . . in life and lumen output. Design combines optical assembly, ballasts and photoelectric control into a single unit. Ten-page Bulletin GEA-7210 gives engineering details, lighting layouts and application data. Circle the reply card or write General Electric Co., Schenectady 5, N. Y.

Listen While Recording Conversations

137. The Dictaphone-Dictacord recorder logs conversations on Dictabell records with simultaneous play-back; it has connections for both telephone and loudspeaker. Write for illustrated folder from Dictaphone Corp., 730 Third Avenue, New York 17, N. Y., or check the reply card.

Battery Powered Hoist For One-Man Operation

148. Cable hoist with telescoping and rotating boom may be mounted on a truck for operation from 12 and 24-volt battery systems; five models available in capacities 600 to 3,000 lbs. Read all about it in Catalog No. 6 by writing Auto Crane Co., 1214 South Norwood, Tulsa, Okla., or circle the reply card.

Traffic Paints Should Have Durability and Visibility

149. How to provide these qualities with Pliolite S-5 and Pliolite VT basic vehicle resins is given in three technical bulletins, which contain service requirements, performance data, information on glassbead, reflectorizing and traffic paint formulations. Write for Tech-Book Facts Bulletins 57-192, 57-193, and PLS-24, Chemical Division, The Goodyear Tire and Rubber Co., Akron 16, Ohio, or check the reply card.

Street and Driveway Paver Has Features of Big Machine

156. Eight-speed transmission for speeds of 10 to 127 feet per min., 4-ton folding hopper, rubber tires and power steering are features of Suburban Paver which lays any asphaltic material in depths of 34 in. to 1 in. and widths of 8 to 12 ft. Write for Bulletin No. 2654, Sales Promotion Dept., Blaw-Knox Co., Construction Equipment Div., Mattoon, Ill., or circle the reply card.

Refuse Incinerator Stoker

173. Reciprocating grate incinerator stoker actuated by hydraulic power cylinders continually pushes the refuse away from the charge point. For a description and illustrations of this new unit write for Bulletin #2701, Detroit Stoker Company, Monroe, Mich., or check the reply card.

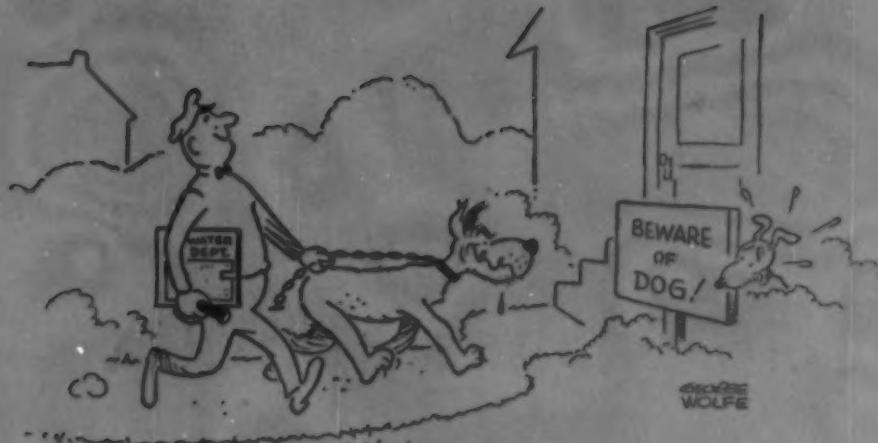
Prestressing Concrete Beams

174. . . is accomplished by high tensile steel wire. 20-page booklet gives application data for various forms of prestressing steel and tells how to order a strand assembly. Circle the reply card or write for booklet on American Super-Tens Wire for Prestressed Concrete, American Steel and Wire Division, United States Steel, Cleveland 13, Ohio.

For Lining Incinerator Combustion Chambers

177. A plastic moldable refractory made of precalcined clays to fill the need for a monolithic lining or for repair of refractory linings is described in bulletin No. 982. Write J. H. France Refractories Co., 9230 France Road, Snow Shoe, Pa., or check the reply card.





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November 1960

Please send me literature on the following items described in PUBLIC WORKS:

Readers' Service Booklets Appear on Pages 34 to 50

20	62	71	109	145	167	197	236	284	360	432	473	540	615	689
21	63	72	111	146	170	200	237	295	367	438	476	542	620	
23	65	62	112	148	175	204	239	307	368	439	480	548	643	
33	56	84	113	155	176	207	247	310	384	446	491	555	645	
37	57	88	121	156	177	211	249	322	385	449	493	558	654	
39	63	97	126	157	179	217	267	330	386	450	504	576	657	
41	64	98	127	158	182	222	269	338	396	455	507	585	669	
42	68	100	131	161	185	223	274	341	397	468	509	586	671	
50	69	104	138	163	190	224	277	344	401	470	532	603	677	
51	70	105	143	168	196	230	283	352	414	472	539	607	681	

New Equipment Items Appear on Pages 186 to 192

11-1	11-2	11-3	11-4	11-5	11-6	11-7	11-8	11-9	11-10	11-11	11-12	11-13	11-14	11-15
11-16	11-17	11-18	11-19	11-20	11-21	11-22	11-23	11-24	11-25	11-26	11-27	11-28	11-29	

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Meetings and Conventions

American Water Works Assn.

Chesapeake Section, Sheraton Park Hotel, Washington, D. C., Nov. 2-4. Sec., Carl J. Lauter, 6955 33rd St., N. W., Washington, D. C.

Nebraska Sewage and Industrial Wastes Assn.

Castle Hotel, Omaha, Neb., Nov. 3-4. Sec.-Treas., E. Bruce Meier, Kirkham, Michael & Assoc., 508 S. 19th St., Omaha 2, Neb.

South Carolina Water and Sewage Works Assn.

Jefferson Hotel, Columbia, S.C., Nov. 4. Sec.-Treas., Robert N. Bowen, 417 Wade Hampton Bldg., Columbia, S.C.

Robert A. Taft Sanitary Engineering Center Courses:

Nov. 7-11, "Radioactive Pollutants in Water"; Nov. 14-18, "Radionuclides in Water." Chief Training Program, 4576 Columbia Pkwy., Cincinnati 26, Ohio, or to USPHS regional office.

American Water Works Assn.

North Carolina Section, Robert E. Lee Hotel, Winston-Salem, N. C., Nov. 9-11. Sec., T. Z. Osborne, Asst. Director of Public Works, Greensboro, N. C.

North Carolina Sewage and Industrial Waste Assn.

R. E. Lee Hotel, Winston-Salem, N. C., Nov. 9-11. Sec.-Treas., T. Z. Osborne, Rm. 309, Municipal Bldg., Greensboro, N. C.

American Water Works Assn.

Florida Section, Galt Ocean Mile Hotel, Fort Lauderdale, Fla., Nov. 13-16. Sec., John G. Simmons, Box 1311, West Palm Beach, Fla.

Florida Sewage and Industrial Wastes Assn.

Galt Ocean Mile Hotel, Fort Lauderdale, Fla., Nov. 13-16. Sec.-Treas., Arthur R. Finney, Jr., 4801 S. W. 117th Ave., Miami 55, Fla.

American Bridge, Tunnel and Turnpike Assn., Inc.

Sheraton-Atlantic Hotel, New York, N. Y., Nov. 14-17. Exec. Sec., J. Allyn Stearns, Northcourt Bldg., 175 Main St., White Plains, N. Y.

Oklahoma Water, Sewage and Industrial Wastes Conference

State University, Stillwater, Okla., Nov. 14-18. Sec.-Treas., H. M. Crane, 3400 Northeastern, Oklahoma City 5, Okla.

Indiana Sewage and Industrial Wastes Assn.

Hotel Washington, Indianapolis, Ind., Nov. 16-17. Sec.-Treas., Victor G. Wagner, State Dept. of Health, 1330 W. Michigan St., Indianapolis 7, Ind.

American Assn. of State Highway Officials

Nov. 27-Dec. 2. Write: A. E. Johnson, 917 National Press Bldg., Washington 4, D. C.

American Road Builders' Assn.

Chalfonte-Haddon Hall, Atlantic City, N. J., Mar. 5-8, 1961. Vice Pres., Louis W. Prentiss, 600 World Center Bldg., Washington 6, D. C.

American Water Works Assn.

Cobo Hall, Detroit, Mich., June 4-9, 1961. Sec., Raymond J. Faust, 2 Park Ave., New York 16, N. Y.

Institute of Traffic Engineers

Sheraton-Park Hotel, Washington, D. C., Aug. 21-23, 1961. Write: David M. Baldwin, Institute of Traffic Engineers, 2029 K St., N. W., Washington 6, D. C.

American Public Works Congress and Equipment Show

Municipal Auditorium, Minneapolis, Minn., Sept. 24-27, 1961. Sec.-Treas., Robert D. Bucher, 1313 East 60th St., Chicago 57, Ill.

Water Pollution Control Federation

Milwaukee Auditorium, Milwaukee, Wis., Oct. 7-12, 1961. Exec. Sec., Ralph E. Fuhrman, 4435 Wisconsin Ave., Washington 16, D. C.

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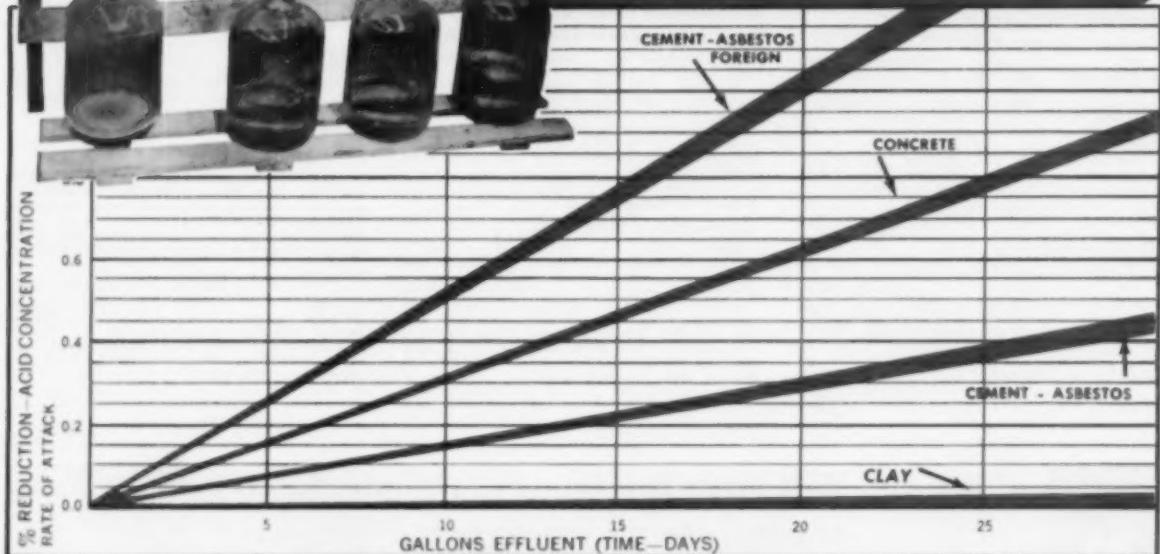
200 South Broad Street

Ridgewood, New Jersey

Readers' Service Dept.



Acid Tests PROVE: NO OTHER PIPE CAN MATCH *Vitrified Clay Pipe*

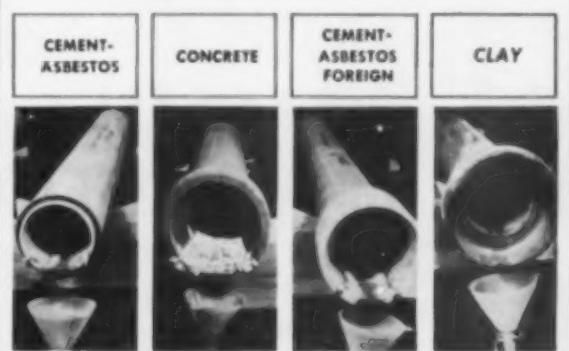


During special tests, conducted recently at the new NCPMI Research and Development Laboratories, approximately 30 gallons of 8.6% sulfuric acid by weight were channelled through four different pipe specimens, including Clay Pipe. The results are shown here in the diagram and photograph. It can be seen that substitute materials started deteriorating rapidly, but the acid attack on Clay Pipe remained at zero throughout the entire test!

When specifying sewer materials, don't be misled by claims made for substitute pipe. Remember these tests and specify Vitrified Clay Pipe...the *only* pipe that can be trusted to handle *everything* that empties into a sewer without danger of deterioration!

Further information on Acid Tests available upon request.

Actual, unretouched photographs show corrosion damage caused by the flow of acid solution.



C-458-5

Vitrified

CLAY PIPE

Never Wears Out

NATIONAL CLAY PIPE MANUFACTURERS, INC., 1620 N Street, N. W., Washington 6, D. C.
211 High Line Bldg., S.E. Long St., Columbus 15, Ohio • 445 Ninth St., San Francisco 3, California • Box 172, Barrington, Illinois • 1401 Peachtree St., N.E., Atlanta 3, Georgia

To order these helpful booklets check the reply card opposite page 34.

NEW LISTINGS (Cont.)

How to Select a Commuter

157. . . . is featured in 8-page leaflet on the 7-model line of Jones and Atwood commutes, built in England and sold in the U. S. by Smith and Loveless. Line drawings, descriptive text and size selection table are given in Bulletin 900. Write Smith and Loveless Div., Union Tank Car Co., P. O. Box 8884, Kansas City 15, Mo., or circle the reply card.

Accomplish Grit Removal,

Pre-Operation and Settling in Single Tank

163. . . . with the new Oxigritter, which separates grit from sewage by aeration. This equipment, available in capacities of 0.52 to 5.72 mgd and 30 to 100 ft. diameters is described with detailed application data in Bulletin SM1016. Get your copy by circling the reply card or by writing The Elenco Corp., P. O. Box 300, Salt Lake City 10, Utah.

Adapting Photocontrols to any

Outdoor Lighting Fixture

170. . . . is simplified for utility, industrial and municipal street lighting management and installation personnel with a new 24-page data file. Illustrated with photographs and technical drawings, the booklet describes tubeless controls with locking type receptacles prescribed by NEMA standards, along with mounting accessories for adapting photo-electric "automation" to all poles, cross arms, pole tops, pendant and old-style fixture heads now in service. For your copy circle the reply card or write Precision Multiple Controls, Inc., Ridgeview, N. J.

The Design and Function

of Elevated Steel Water Tanks

179. A 20-page bulletin of engineering information with illustrations of typical installations, emphasizing ellipsoidal, radial cone and spheroidal designs, may be obtained by writing Chicago Bridge and Iron Co., Advertising Dept., 332 South Michigan Ave., Chicago 4, Ill., or by checking the reply card.

Corrosion-Resistant Feeder For Acids, Alkalies and Slurries

158. The Omega Rotodip liquid feeder, with a range of 5 to 1800 gallons per hour, is easily adapted to respond to mechanical, electric or pneumatic pacing systems in remote control situations. Application data and schematic drawings are given in 4-page bulletin. Write for Ref. No. 0065.20-1, B.I.F. Industries, P. O. Box 1342, Providence 1, R. I. or check the reply card.

Control Odors in Refuse Handling and in Rest Rooms

196. PDC, an odorless deodorant that removes the cause of odor and prevents recurrence for a week, suitable for application in commodes, shower drains, wash basins, refuse containers and other installations, is described in bulletin available from A. J. Parker Co., Philadelphia 4, Pa. Write manufacturer or circle the reply card.

Dry Chemical Feeder Handles Powder, Granular or Lump Materials

197. Bulletin 260 discusses the mechanism and operating principles of the type "G" gravimetric feeder, which has 20 to 1 operating range and an accuracy of one percent. Electrical and operating controls are integral parts of the unit but are separated from the feeding mechanism by a dust-tight partition. Write Infileo Inc., Tucson, Ariz. or circle the reply card.

How to Select Nozzles For Decorative Fountains

200. . . . is the subject of a 30-page bulletin describing hollow-cone, solid-cone and flat-sheet spray nozzles; jet nozzles; adjustable nozzles and mushroom spray nozzles; includes specifications, capacity information and detailed drawings of the spray effect of each type and size to permit proper selection. Write for data File 6A-FN from Dept. JA-27, Schutte and Koerting Co., Cornwells Heights, Bucks County, Pa., or check the reply card.

Make Economy Part Of Your Fleet Operation

304. . . . by investigating the gasoline mileage, performance and safety advantages of the new '61 Lark. Get information on fleet experience by writing Fleet Sales Div., Studebaker-Packard Corp., South Bend 27, Ind., or circle the reply card.

REFUSE COLLECTION AND DISPOSAL

Where Does It Go From Here?

63. That is the title of new 12-page booklet, D 930, with thorough discussion of garbage disposal by sanitary landfill method. Read the latest report from the experts. Caterpillar Tractor Co., Peoria, Ill., or check card.

Literature Describes M-B Contain-O-Pack System

190. A 6-page catalog describing the M-B Contain-O-Pack, a complete low cost containerized refuse system for private haulers and municipalities is available from M-B Corp., New Holstein, Wisc. Check the reply card.

Incinerators for the Disposal of Combustible Wastes

217. Bulletin 184A from Morse Boiler Inc., New York 11, N. Y. describes fully the basic principles of incineration as to combustion, auxiliary burners, draft and control and elimination of fly ash. Specifications and design of incinerators and hopper doors are included.

New Dempster Book

307. . . . tells the full, illustrated story of what Dempster Brothers offer in the way of wastes collection, containerization and disposal equipment. 28 pages in color. Get your copy from Dempster Bros., Knoxville, Tenn., or circle our reply card.

Will your loader investment dollars depreciate or compound interest?

KOEHRING

VERSATILE SKOOPER BREAKS ALL COST BARRIERS IN HIGH PRODUCTION LOADING

*There's nothing like it—
on wheels or tracks!*

Skooper has enabled many a road, street and highway department to increase loading capacity while cutting maintenance and downtime to the bone. It has a 7' hydraulic crowd to load the bucket without using any tractive effort. With a Skooper there's no flying starts, no burning tires, no churning crawlers. Result: lower maintenance . . . less fuel does more work. Highest production at lowest possible cost.

The Skooper's 7' crowd, combined with a full 360° swing, enables it to load up to 400 tons per hour, while standing still. There's nothing like it on wheels or tracks. And you can convert Skooper to hoe, dragline or crane at any time.

For the best in loading, Skooper gives you more work capacity per dollar invested . . . bonus tonnage with less maintenance. See your Koehring distributor soon.

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DIVISION OF KOEHRING COMPANY
Milwaukee 15, Wisconsin

To order these helpful booklets check the reply card opposite page 34.

WATER WORKS

Ball and Socket River Crossing Cast Iron Pipe

33. Literature is available describing Clow ball and socket cast iron pipe for river crossing, or any installation where full 15 degree free turning deflection is desirable. For description and specifications, address James B. Clow & Sons, Inc., P. O. Box 6600-A, Chicago 80, Ill.

Propeller Meters For Dependable Water Metering Control

33. The complete line of Measure-Rite propeller meters are described in Bulletin MR-105 available from Measure-Rite, Inc., 4345 W. Brown Deer Rd., Milwaukee 23, Wis. Check the card for details on these accurate meters.

For Fast, Smooth Pipe Cuts

68. Descriptive literature on the Reed 4-wheel hinged pipe cutter which operates in close quarters, gives quick, easy right-angle cuts, and is available from Reed Mfg. Co., Erie, Pa. Check the reply card.

Easily Cleaned Long Run Filter Bed Media

78. Bulletins on Anthrafil tell the reasons why selected, graded crushed anthracite is superior to sand as a filtering material. Have you made a full investigation? Write Anthracite Equipment Corp., Wilkes-Barre, Pa.

100 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH, Chlorine and Phosphate Control and descriptions of comparators for making colorimetric analyses. A 100 page booklet is available by checking reply card. W. A. Taylor & Co., 7394 York Road, Baltimore 4, Md.

Pipes and Fittings

53. Full engineering data on products of the Alabama Pipe Co., including Super DeLavaud cast iron pressure pipe and pipe fittings, valve boxes and other municipal castings are provided in Pressure Pipe Catalog No. 54, a 196-page publication of Alabama Pipe Co., Anniston, Ala. Weights, dimensions and specifications are clearly indicated in this easy to use reference.

Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

High Frequency Resistance—Welded Steel Pipe . . .

72. Available in 6" to 16" diameters, in wall thickness to .219, special wrappings and coatings available. For attractive booklet, including specifications and details of field joints write Valley Mfg. Co., Valley, Neb., or circle our inquiry card.

Before Taking Bids on Water Storage Tanks . . .

104. Learn more about GATX tanks, designed and fabricated by one of the nation's largest steel fabricators in accordance with AWWA specifications and municipal requirements. For detailed information, address Plate and Welding Div., General American Transportation Co., 135 So. La Salle St., Chicago 3, Ill., or circle our card number.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Robert's Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Facts About Transite Pipe for Water Mains

121. Engineers can secure four pieces of illustrated literature that cover installation, operation and maintenance economies of Transite and Ring-Tite couplings for pressure mains. DS-315 is a material specification, TR-15A a Friction Loss of Head and Flow Powergraph, TR-62A an Installation Guide, and TR-160A in-service characteristics and case histories of water pipe. Tables of weights, sizes, pressure classes included. Address Johns-Manville, 22 Old St., New York 16, N. Y., or check above number on card.

A Handy List on "In Stock" Pipe

148. . . . is issued monthly by L. B. Foster Co. to show all stock footages of seamless and welded pipe, structural steel pipe and other specialties. Enables you to order pipe with exact knowledge of what is immediately available. Address L. B. Foster Co., P. O. Box 1647, Pittsburgh 30, Pa., or you can just check number on our card.

AWWA Fire Hydrants and Gate Valves

138. Above-ground maintenance Mueller AWWA improved fire hydrants and minimum maintenance Mueller AWWA non-rising stem gate valves are described in literature from Mueller Co., Decatur, Ill.

Valve and Hydrant Construction Details

161. A 72-page catalog-type bulletin, just completed, gives detailed data on construction and application of gate valves, check valves and hydrants for water works service. Write for Bulletin 5710 from Darling Valve and Mfg. Co., Williamsport, Pa., or check the reply card.

Mechanical Joint Tapping Sleeve and Valve

344. Smith tapping sleeve and valve answers the problem of making connections, in sizes 2 in. and larger, in water lines under pressure. Check the reply card or write The A. P. Smith Mfg. Co., East Orange, N. J., for full details.



To order these helpful booklets check the reply card opposite page 34.

Complete Catalog and Reference Data on Valves and Fittings

221. The entire M & H line of valves, fittings and accessories for water works, ultra-tight, sewage disposal and fire protection are illustrated and fully detailed in Catalog 54 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

Helpful Data on Water Meters

220. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, valves, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 23, Wisconsin.

To Meet Increasing Water Demands, These Two Steps Will Help

247. Two new products designed to help meet constantly increasing demands for water are described in a folder of Hersey-Sparling Meter Co., 250 Elm St., Deharn, Mass. These are a flow analyzer that provides strip chart rate of flow and volume records, and a two-rate register that can be substituted for the flow analyzer. Get this data by checking our reply card.

Air Control Valves For All Types of Pipelines

420. Literature on Crispin Air Valves, which safely control air in lines handling liquids, to maintain efficient operation and prevent expensive failures, is available from Multiplex Manufacturing Company, Dept. C, Berwick, Pa. Write today for your copy of the Crispin Air Valve Catalog, which offers complete information on the full line of dependable Crispin Air Valves.

Meters and Instruments For Water Works

224. An attractively arranged 40 page catalog in full color issued by Hersey-Sparling Meter Co., 225 No. Temple City Blvd., El Monte, Calif., furnishes concise data on the full line of Sparling meters, indicator-totalizer-recorder instruments and other special instruments and controls. Check the reply card for your copy, or write for Bulletin 314.

A Quick Comparison of Water Meters Helps

274. That is the purpose of the new bulletin describing the newest accomplishments in water meter design and manufacture. With it comes a Condensed Catalog of the Rockwell line. Ask for Bulletin No. W-811 from Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa., or check the card.

Do You Know the Value of the V-Notch?

293. A new booklet tells what you want to know about how chlorine feeding can be made as regular and precise as the sunrise. Ask for "The V-Notch Story" direct of Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J., or check the card-number.

Be Independent of Power Failures

432. As a first step, ask for catalog of engine-driven generating sets for standby or continuous duty service. Range from 500 watts up through 150 KW in gas or gasoline models to 750 KW diesel category. Address Katolight Corp., Mankato, Minn.

Locate Water Leaks Quicker and Easier

474. An aquaphone that requires no mechanical connection between probe and diaphragm to break or cause of trouble is described fully in literature from Aqua Survey & Instrument Co., 824-B North Bend Rd., Cincinnati 24, Ohio.

To Insert Valves Under Pressure . . .

535. . . let your first step be review of this "step-by-step" folder on Mueller tapping and cutting-in sleeves and valves. Write Mueller Co., Decatur, Ill., for Form W-8899 or circle number on our card.

Streamlined and Modernized Fire Hydrants

607. Models, dimensions and advantages of the Eddy fire hydrant are covered in bulletin from the Eddy Valve Co., Waterford, N. Y. Check the reply card for complete details.

When the Frost is on the Meter

618. If it is an American frost-bottom meter freezing is no major problem. The replaceable center section breaks out leaving the mechanism undamaged. Bulletin 58 tells the story. Address Buffalo Meter Co., Inc., 2917 Main St., Buffalo 14, N. Y., or circle reply card.

Turn Your Water Meter Reading Inside-Out

671. The Visi-Meter is a remote recording and indicator system that eliminates the need of entering the home to read water meters. It records within an accuracy of 0.1 percent. Check the reply card or write Visi-Meter, Inc., 301 North 17th St., Kansas City, Kans., for literature.

Electronic Locators for Water Mains, Services, Valves and Boxes

677. Miniatured line locator that is encased in a molded glass fibre container and has transistors that have a rated life of 70,000 hours and weighs only four lbs. when completely assembled is described in literature from Wilkinson Products Co., 3067 Chevy Chase Drive, Pasadena 3, Calif. Check the reply card.

Bulletin Covers Step-by-Step Action on the Water Problem

689. A step-by-step outline of action telling how the responsible citizens can help their officials extend and improve the local water system through more adequate rate structures on financing is covered in this bulletin available from Thos. F. Wolfe, Managing Director, Cast Iron Pipe Research Association, 3440 Prudential Plaza, Chicago 1, Illinois.

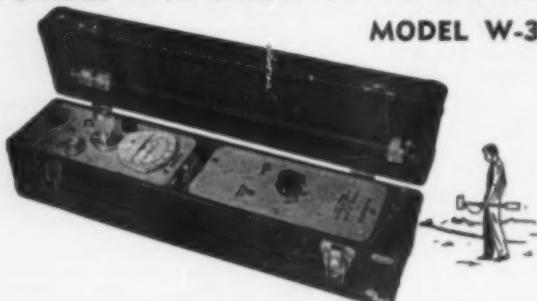
NEW MINIATURIZED WILKINSON LINE LOCATOR

Radically new, powerful, transistorized locating instrument weighs only 4 lbs. and is $\frac{1}{4}$ as large as old type pipe locators.

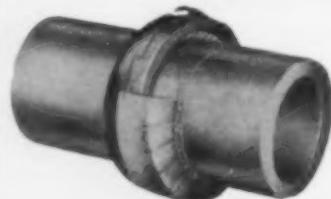
Telescoping aluminum handle; 2 oz. single ear set; all in carrying case.

Write today for brochure and instruction manual.

WILKINSON PRODUCTS COMPANY Since 1940
3987 Chevy Chase Dr., Pasadena 3, Calif. SYlvan 0-4314



BUILD BETTER SEWER LINES



with
WESTON
GASKETS and FORMS
for
SEWER PIPE JOINTS
(a cement joint)

- No jute used—gasket centers spigot.
- Definite space in each joint for cement.
- Form confines cement-grout to lower portion of joint.
- Particularly advantageous in water-bearing trenches.
- Infiltration minimized.

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Steel For A Perfect Purpose

Here's an all-steel, non-springing print file, saving time, motions, space and overhead. Users win longer print "life".



Thumbnuts in plan holders provide direct clamping. No secondary spring mechanisms. Tighten after plans are inserted.

Self-contained T-tops fit channels, are retained from end-to-end. Plan holders "glide" easily in or out.

As needs enlarge, add channels and plan holders. Same-size, attachable extensions are available. For faster reference, extra speed and system, here is the lowest priced vertical plans file.

* Literature and prices available on request

MOMAR Industries
1176 Marquette Ave.
Chicago 41, Illinois



HOW YOU CAN SAVE MONEY ON WATER SERVICE VALVES

For pump checks, block valves, transmission mains or any other service where flow control is important, more and more water utilities are specifying Rockwell-Nordstrom lubricated plug valves. Why? Because they're far more compact than other valves—saving costly space—yet they shut off positively with just a $\frac{1}{4}$ -turn.

Rockwell-Nordstrom valves save money in other ways. The pressurized lubricant that assures positive shutoff also prevents metal-to-metal

wearing friction for longer valve life and lower maintenance cost. And, valve downtime is virtually eliminated—the *tapered* plug seats perfectly on a cushion of lubricant, removing any chance of "stuck" valves. For electric, pneumatic and cylinder operation, Rockwell-Nordstrom valves are available in sizes from $\frac{1}{2}$ " to 36", pressure ratings to meet your needs.

Rockwell Manufacturing Co., Pittsburgh 8, Pa.
Canadian Valve Licensee: Peacock Brothers Limited.

ROCKWELL-Nordstrom VALVES

another fine product by

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Department 173L
Pittsburgh 8, Pennsylvania

Please send me Bulletin C-5200.

Please have your sales engineer call.

Name _____ Title _____

Address _____

City _____ Zone _____ State _____

To order these helpful booklets check the reply card opposite page 34.

SEWERAGE AND WASTE TREATMENT

What You Should Know About

Trickling Filter Underdrains

26. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 208 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

You Don't Need a Big Plant

to Get Big Savings

31. . . . in mechanical sludge dewatering. Now the smaller plant can cut power costs, eliminate use of chemicals and reduce labor. 4-page bulletin on the "Roto-Plus" sewage sludge concentrator shows how this is accomplished. Write for Bulletin 100 to Nichols Engineering & Research Corp., 80 Pine St., New York 5, N. Y., or check the card-number.

Theory of Controlled Digestion

With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Easy Way to Get Up-to-date on Culvert Pipe

269. This new illustrated catalog CMS-5859 is full of facts and ideas that you can use. Gives data on joints, fittings and proper installation methods. Your catalog shelves will be less than complete without it. Address Armclo Drainage and Metal Products, Inc., Middletown, Ohio, or just check our card.

How to Make Better Sewer Pipe Joints

37. How to make a better sewer pipe joint of cement-tight, minimizing root intrusion, better alignment of joint. Permits making joints in water-bearing trenches. General instructions issued by L. A. Weston Co., Dept. P.W., Adams, Mass. Check the reply card.

Catalog on Synchronous Motors and Controls

64. A 27-page Catalog B-7292 on synchronous motors and controls is well illustrated and contains motor selector charts, application data, and formulas for calculating power factor. For a copy write Westinghouse Electric Corp., Box 2999, Pittsburgh 30, Pa., or check the reply card.

Stationary Engines For Sewage and Water Treatment Plants

82. Engines that operate on sewage gas, gasoline, butane or natural gas are described in literature from Climax Engine Mfg. Co., Div. of Waukesha Motor Co., Clinton, Iowa. Check the reply card.

There's Far More Than

Meets the Eye in Cyclone Fence

168. Get the full story of all that this fencing is and what it can do for you around expressways, reservoirs, sewage works, pumping plants, incinerators, landfills, recreation areas, storage yards and the many other places where public works need protection. Address Cyclone Fence, American Steel & Wire, 614 Superior Ave., N.W., Cleveland 13, Ohio; or circle the number on this card.

Turnkey Sewage Treatment Plant

239. Plants for smaller population areas that are furnished and installed on a turnkey basis are covered in literature from Municipal Service Company, 4625 Roncoke Parkway, Kansas City 12, Missouri. Check the reply card for your key to low cost sewage treatment.

Protective Lining for Concrete Pipe and Structures

131. T-Lock Amer-Plate is a tough, long-lasting acid-resistant vinyl sheet lining for concrete pipe and structures which are exposed to corrosive materials. T-shaped ribs pressed in the sheet are embedded in the concrete as it is poured to lock the lining permanently in place. Get full details from Amercoat Corp., South Gate, Calif.

Elliptical Concrete Pipe for Sewers and Culverts

143. A 4-page bulletin is available from United States Concrete Pipe Co., 1500 Union Commerce Bldg., Cleveland 14, Ohio, on the use of elliptical pipe to obtain round pipe flow equivalents in certain areas. Check the reply card for diagrams, data charts and tables that fully describe elliptical pipe sizes and compute discharge flow rates for the full range of pipe sizes.

A Short Course in Pipe Jointing

169. . . . contains nine sections of the latest engineering information on machine-made roller, suspension, cast, special, reinforced concrete pressure and reinforced concrete subaqueous pipe. Organized for quick reference regarding construction, applications and sizes. A real gold mine of pipe line information. Address Lock Joint Pipe Co., Box 269, East Orange, N. J., or check the number above.

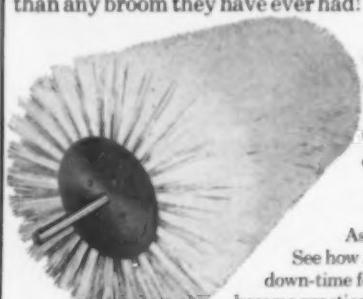
68-Page Sewer and Culvert Pipe Catalog

318. . . . contains nine sections of the latest engineering information on machine-made roller, suspension, cast, special, reinforced concrete pressure and reinforced concrete subaqueous pipe. Organized for quick reference regarding construction, applications and sizes. A real gold mine of pipe line information. Address Lock Joint Pipe Co., Box 269, East Orange, N. J., or check the number above.

Well I'll be d....!



Everyone's remark when they see the startling RADAX Broom Coil demonstration. Never before anything like it—for low price—for speed—for long life and—users say it sweeps better than any broom they have ever had!



- NO CORES TO BUY
- LONG WEARING Plastic Filament
- PRE-FABRICATED
- "JET-SPEED" FILLING 5 minutes or less for a new refill—READY TO GO!

Ask for a demonstration.

See how and why your sweeper down-time for broom renewals will become practically nil.

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TO YOUR
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SWEEPER MAKE and MODEL	SR FILAMENT	TYNEX NYLON
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MOBILE 58" BROOM	\$208.30	\$310.60
WAYNE 450, 460, 520 and 550	\$169.75	\$252.50
ELGIN STREET KING	\$258.20	\$388.10
ELGIN WHITE WING	\$258.20	\$388.10
ELGIN 20, 30, and 81	\$270.15	\$399.95
AUSTIN-WESTERN 40	\$208.15	\$303.55
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Rugged GLEDHILL SNOW PLOWS
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When you're dealing with public highways you're committed to do the best possible job. Connecticut chose Gledhill Snow Plows to handle their snow removal problem.

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THE GLEDHILL ROAD MACHINERY CO., Galion, Ohio



At Westchester County's New Rochelle Sewage Plant:

Bitumastic coatings still sound after 5 years service on concrete tank walls

Opened in 1955, the New Rochelle Sanitary Sewer District plant is designed ultimately to serve a population estimated at 81,000 by 1975. In designing for the future, County engineers of the Department of Public Works recognized the problem of plant and equipment protection: that's why they specified that certain areas in the plant be protected with Bitumastic coatings.

On the settling tanks shown, two coats of Bitumastic® Super Service Black were applied to all concrete surfaces to prevent erosion at the water line. On trash racks and other intermittently submerged metal surfaces, the same coating system was applied. A recent inspection after five years of operation showed that these protected areas still require no recoating.

Bitumastic coatings were used on the inside of four concrete digesters, too. A base coat of thick, heavy-duty Bitumastic No. 50 covered with Bituplastic® No. 28, a coal tar emulsion-type coating, helped to seal the domes of the digesters against the corrosive effects of condensation.

Sanitary engineers in all states are familiar with the proved protective qualities of Bitumastic coatings. For a booklet describing their specific applications in this field, use the coupon. Koppers Company, Inc., Tar Products Division, Pittsburgh 19, Pa. District

offices: Boston, Chicago, New York, Los Angeles, Pittsburgh and Woodward, Ala. In Canada: Koppers Products, Ltd., Toronto.



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BITUMASTIC
COATINGS AND ENAMELS
another fine product of COAL TAR

KOPPERS COMPANY, INC.
Tar Products Division
Dept. 138L
Pittsburgh 19, Pa.

Gentlemen:
Please send me your booklet T93 on sewage plant protection with Bitumastic Coatings.

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Firm _____ Title _____

Address _____

City _____ Zone _____ State _____



To order these helpful booklets check the reply card opposite page 34.

Renew Pipe Performance With Cement Mortar Lining

322. Application of the Tate and Spuline process for cement mortar lining of existing pipe lines with a minimum of interruption of service is described, with diagrams, photographs and specifications in Catalog 13-58. Write to Pipe Linings, Div. of American Pipe and Construction Co., P. O. Box 457, Wilmington, Calif.

Submersible Pumps For Municipal Use

341. A new 12-page bulletin that describes the line of BJ submersible pumps is available from Byron Jackson Pump Inc., P. O. Box 2017, Terminal Annex, Los Angeles 54, Calif. Construction and operation of the pumps are covered along with a handy selection chart that gives capacity and head performance.

End Sewage Pumping Unhappiness

480. This new folder shows how others have done it, and why. It can be your road-map to satisfaction through "High and Dry" self-priming sewage pumps. Address The Gorman-Rupp Co., Mansfield, Ohio, or circle our card.

Equipment For Sewage Disposal Plants

585. Sewage gas meters, gas regulators, lubricated plug valves and water meters are described in Bulletin C-5200-3, available from Rockwell Mfg. Co., Meter and Valve Div., 400 N. Lexington Ave., Pittsburgh 8, Pa.

Manual on Solving Drainage Problems

648. An 80-page Manual on the problems of drainage and drainage materials is available. Design section includes determining culvert lengths and sizes, run-off calculations, excavation of base and backfilling data. Check the reply card or write Bethlehem Steel Co., Bethlehem, Pa., for the third revision of this valuable book containing new tables for evaluating flow fraction.

Simplify Sewage Plant Design with Couplings

360. How to use style 38 Dresser couplings to the best advantage in sewage treatment plant design are illustrated with typical piping diagrams and size and specification tables in 18-page bulletin. Check the reply card or write the Dresser Mfg. Div., Bradford, Pa.

Trenchers for Water and Sewer Line Construction

384. Three Cleveland J trenchers incorporating major advances in trencher design and operating advantages are described in Bulletin L-104 available from The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. Check the reply card for digging capacities, specifications and dimensions.

Small Unit Sewage

Treatment For 20 to 3000 People

348. Bulletin 135A describes the Rate-Operation process, a low cost, odorless, trouble-free sewage treatment process. Check the reply card or write Chicago Pump Co., 622 Division Parkway, Chicago 14 Ill.

Play Safe with Automatic Controls

603. Remote engine and pumping controls of every sort are fully described in a series of bulletins offered by Synchro-Start Products Inc., 8151 N. Ridgeway Ave., Skokie, Ill. Write or circle the above number on our card.

Full Line of Sewer Cleaning Equipment

681. Everything for rodding sewers from hand operated equipment to the fully mechanized SewerRodeR. Tools for all types of stoppages are operated by Flexicrom Steel Sewer Rods. Featuring the Truck-Loder which dumps sewer deposits directly into truck, a complete range of Bucket Machines is offered. All equipment is described in 48-page Catalog 59-A. Flexible, Inc., 3786 Durango Ave., Los Angeles 34, Calif.

Sees 'em and Seals 'em

548. Leaking joints in storm and sanitary sewers are detected and sealed by the new CentriLine Process. It's all done by remote control, constantly monitored by television. Get all the details by writing CentriLine Corp., 140 Cedar St., New York 6, N. Y., or check the inquiry card.

STREET LIGHTING AND TRAFFIC CONTROL

Highway Lighting

Engineering Guide

207. This catalog is primarily aimed at the new highway lighting program that is being undertaken nationally. It gives data on the quantity of light required; lighting on main traffic lanes, interchanges, intersections, toll plazas and bridges. It also covers information on the relative cost of lighting and the selecting of the light source. Write to Westinghouse Electric Corp., Lighting Div., 1216 West 58th St., P. O. Drawer 5817, Cleveland, Ohio.

Lighting Standards for Every Outdoor Lighting Requirement

384. Complete design details, typical installation photos and how Stress-Spun standards are made are covered in this valuable guide. Check the reply card or write to the American Concrete Corp., 5092 North Kimberly Ave., Chicago 30, Ill., for Catalog 400.

Cut Crime and Accidents

398. . . . with better street and highway lighting. Good design means good lighting standards, arms, bases and luminaires. A catalog, ALS-5, is just out containing working engineering specification data, over 20 drawings and complete and detailed data on various Pfaff and Kendall lighting standards, including luminaire specifications. The entire catalog is cross indexed. Address Pfaff & Kendall, 84 Foundry Street, Newark, N. J.

HEAVY DUTY D.C. SOLENOIDS



Available in all standard voltages up to 115V D.C.

May be energized continuously, but ON and OFF cycle should not exceed 6 per minute. Model SI, which is illustrated, has a pull of 10 lbs. over $\frac{1}{2}$ " stroke, weighs $2\frac{1}{4}$ lbs. Other models with 1" and $1\frac{1}{2}$ " stroke are available.

All units have been completely redesigned and are capable of providing in excess of two million operations. Their splash-proof construction makes them ideal for operating engine throttles, chokes, small clutches, valves, etc. For further information write for Bulletin 505A.

SYNCHRO-START PRODUCTS, INC.
8151 N. RIDGEWAY AVENUE, SKOKIE, ILLINOIS

Good Roads "Jet" Spreaders



A SIZE AND STYLE FOR EVERY NEED! Ideal for salt, cinders, sand or gravel, cab operated "Jet" Spreaders provide the speed and capacity essential for fast efficient ice control on streets and highways.

Available in engine-driven, hydraulic and direct power take-off models. Width and depth of spread, and spread pattern are easily varied to meet any requirement. Standard models feature $5\frac{1}{2}$ and 6 cubic yard hopper capacities . . . larger sizes are also available. For complete information, see your Good Roads distributor or write:



GOOD ROADS MACHINERY CORP.

MINERVA, OHIO

Concrete adhesives and mortars with THIOKOL polysulfide polymer MAKE LITTLE OF BIG REPAIRS



STRUCTURAL. Polysulfide-modified concrete adhesives join new concrete to old—or rejoin old sound concrete—with a watertight bond that's stronger than concrete itself. They have wide use in vertical building. Their applica-



tion on this fire-damaged marine terminal (gutted concrete sprayed with adhesive then new concrete poured) avoided complete reconstruction, saved the city years of time and millions of dollars in remedial costs.



ROADWAYS. Polysulfide-modified mortars patch potholes and fill ruts and dips. In this application, adhesive and aggregate are mixed in a ratio of 1 to 5, spread and troweled like concrete. Digging down to bedrock or ex-



posing steel reinforcements and pouring new concrete (conventional repair techniques which tie up traffic for days) is avoided. Polysulfide-modified mortar cures fast. Time, labor and the public temper saved.



FLOOR PATCHING. In plants where regular concrete has broken down under exposure to abusive traffic, chemicals or corrosive agents, mortars with THIOKOL polysulfide polymer have stood the test of time and wear.

*Registered trademark of the Thiokol Chemical Corporation for its liquid polymers, rocket propellants, plasticizers and other chemical products.

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In Canada: Naugatuck Chemicals Division, Dominion Rubber Co., Elmira, Ontario

Thiokol Chemical Corporation is the raw material supplier of polysulfide polymer used in the manufacture of concrete adhesives and mortars.

FOR MORE INFORMATION: Mail Coupon to Dept. 2 CA-53
Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N.J.

Send Thiokol's booklet "Concrete Adhesives for Concrete Construction & Maintenance." Also, a list of manufacturers marketing concrete adhesive systems.

Name _____

Firm _____

Street _____

City _____ Zone _____ State _____

Chief Interest: Structural Roadways Floor Patching

To order these helpful booklets check the reply card opposite page 34.

BUSINESS ADMINISTRATION

If You are Considering a trustee
for a Bond Issue Check with
Chase Manhattan

236. For details on how a bank serves as trustee for bond issues for any municipal or governmental unit, write The Chase Manhattan Bank, 40 Wall St., New York 15, N. Y.

Complete Bulletin

On Municipal Supplies

473. Everything from leak locators to street signs is listed in the big 100 page bulletin "Municipal Supplies" published by Darley. Hundreds of different items for all city departments are included. Get your copy of Bulletin No. 155 from W. S. Darley & Co., 2814 Washington Blvd., Chicago 12, Ill.

Monthly Time

and Cost Record Book

249. To assist owners in determining the cost of owning and operating equipment Caterpillar Tractor Co., News Service, Peoria, Ill., has prepared a 24-page monthly time and cost record book. Twelve sets of pages are included on which to record day by day machine expenses for an entire year. Check the reply card for your copy.

Make Blueprint Filing

Easier and More Efficient

542. A blueprint rack for engineering departments that is made of steel and is equipped with 12 plan holders is described in literature available from Monar Industries, 4323 West 32nd St., Chicago 23, Ill. Check the reply card for price list and the advantages of this easy to move and complete unit.

CONSTRUCTION EQUIPMENT AND MATERIALS

New Literature on Tractor Loaders

55. Full illustrated descriptions on Allis-Chalmers TL-12 and TL-14 Tractor Loaders are furnished in bulletins MS-1386 and MS-1373 respectively. Write Allis-Chalmers Construction Machinery Div., Milwaukee 1, Wis.

400 Tons an Hour With Only 64 Hp . . .

190. That's just one report on the Koehring "Skoper" which is combining the full-revolving swing of a shovel with the big bucket capacity and versatility of a tractor loader, giving a new concept in speed loading. Cut costs at every turn. Address Koehring Div., 3026 W. Concordia, Milwaukee 16, Wis.

How to Get

Better Grader Operation

111. A most interesting and instructive 20-page illustrated action booklet on how to operate a motor grader is now available from Galion Iron Works & Mfg. Co., Galion, Ohio. Designed to help operators get more effective use from the versatile motor grader, this booklet covers the hydraulic system, steering, tips on leaning wheels, proper blade positioning, turning, gear speeds and operating procedures. Colorful, easy-to-read presentation guarantees good readership. Check the reply card for your copy.

Data on Portable

Hydraulic Earth Borer

138. Complete specifications on the Holan hydraulic earth borer are available from J. H. Holan Corp., 4100 West 150th St., Cleveland 11, Ohio. Check the reply card for literature.

Tractor-Shovels With Drott "Four-In-One" Attachment

252. Tough rubber-tired front-end loaders come equipped with the Drott "4-in-1" bucket. Check the reply card or write The Frank G. Hough Co., Libertyville, Ill., for literature on how to use this unit as a shovel, clamshell, scraper and bulldozer.

Big Tractor-Powered Equipment

540. Including tractor shovels, dozers, scrapers, loggers and special equipment models and features illustrated and described in attractive brochure available from Clark Equipment Co., Construction Machinery Div., Benton Harbor, Mich. Or just check number on our card for us to order for you.

Complete Line of

Asphalt Patching Mixers

586. Mixers capable of mixing 5 to 20 tons of hot mix per hour are described in literature available from McConaughy Mixers, Inc., Lafayette, Ind. Check the reply card for full information on patching, repairing, resurfacing and sealing.

Attachments

For Ford Tractors

643. Clearing, backfilling, ditching, excavating, mowing, scarifying, sweeping, and trenching equipment are a few of the attachments described in literature from Tractor and Implement Div., Ford Motor Co., 2500 East Maple Road, Birmingham, Mich.

To Heat and Re-Mix

Stockpiled Asphalt

654. . . the Wylie HEAT-A-MIX Tailgate Asphalt Mixer can ease your labors. New 4-page fully illustrated brochure describes how it works and why you need it. Address Wylie Mfg. Co., Box 7086, Oklahoma City 12, Okla., or circle above number on card.

Construction Guide

For Engineers and Builders

669. A 34-page four sectioned construction guide containing full-page structural drawings that provide basic information on types, grades and applications of fir plywood for engineers and builders has been released by Douglas Fir Plywood Association, Tacoma 2, Wash. Check the reply card for data on floor construction, single and double wall construction and roof construction.

ATTENTION on-the-move users of WISCONSIN-POWERED equipment



you can get
factory-engineered
parts and service

for WISCONSIN ENGINES anywhere...at any time!

You can't predict service emergencies. But you can take positive steps to minimize time loss and costs when one strikes. For no matter when or where the need arises, you are always near one of the 2000 Authorized Wisconsin Engine Service Stations for on-the-spot parts and service.

You can always count on prompt, professional service to restore your Wisconsin Engine to like-new condition fast! Your Wisconsin Engine is cared for by factory-trained trouble-shooting specialists. They use Wisconsin parts that are factory-engineered to original Wisconsin Engine specifications and quality. The result:

better performance and longer life for your Wisconsin Engine and the equipment it powers.

You are protected even if you service your own, or if you rely on an independent repair shop or the original equipment dealer. Every Authorized Wisconsin Service Station can supply them with Wisconsin factory-engineered parts quickly.

Make it a point to specify Wisconsin factory-engineered parts — and service — for your Wisconsin-powered equipment. Send for complete Service Station Directory S-198, and for Service Bulletin S-261. Write Dept. U-20.

All Authorized Service Stations carry the full line of WISCONSIN PARTS:

pistons, piston rings and pins • valves and valve seat inserts • valve guides, locks, springs • connecting rods • gaskets and seals • oil filter elements • governor parts • spark plugs • magneto • carburetors • fuel pumps • repair kits • cylinder heads • fuel tanks and many other parts.



WISCONSIN MOTOR CORPORATION
MILWAUKEE 46, WISCONSIN

World's Largest Builders of Heavy-Duty Air-Cooled Engines

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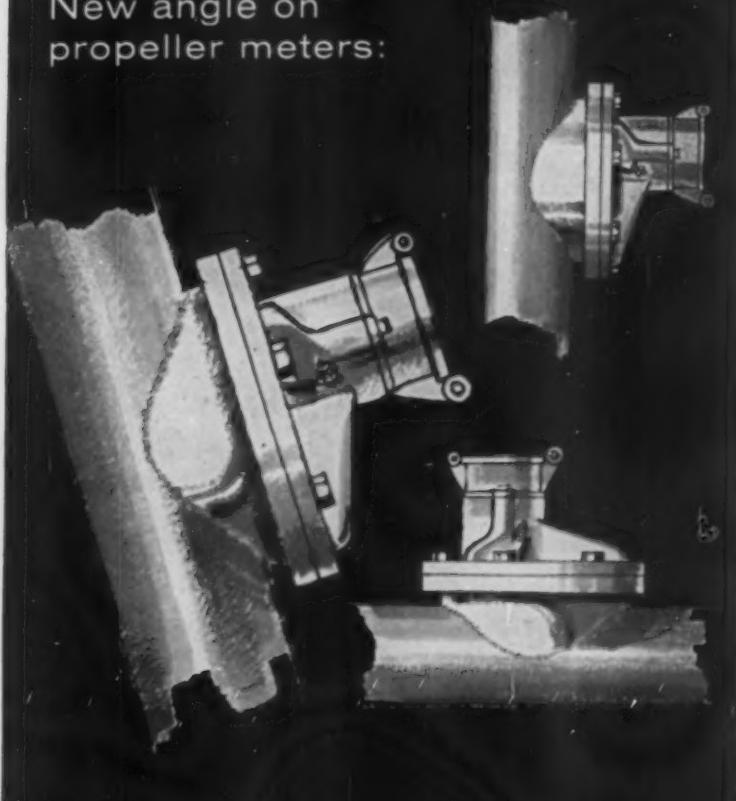
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CIVIL & SUSPENDED STRUCTURE

When it comes time to appoint a trustee or fiscal agent for revenue bonds, The Chase Manhattan Bank is at the service of state, county and municipal authorities. Chase Manhattan has the staff and experience to handle this function as trustee or fiscal agent in cooperation with banks in the areas where the projects are located. For complete details write: Corporate Trust Division, The Chase Manhattan Bank, 40 Wall Street, New York 15.

To order these helpful booklets check the reply card opposite page 34.

New angle on propeller meters:



Measure-Rite meters

vary in mounting position
but never in accuracy

Even *inclined*, Measure-Rite propeller meters will accurately register water flow. This major design advantage is just one of many Measure-Rite refinements. Here's more:

- **Free-flow design** — Puts the assembly forward, full centered in chamber to assure low loss of head.
- **High accuracy over wide range** — Measure-Rite meters register within $\pm 2\%$ when used within recommended range.
- **Adaptable to recording and chemical feed control**.

All Measure-Rite meters can be equipped with Badger Read-o-Matic for convenient station-by-station meter reading. Write for full details on complete line, or see your Badger representative.

MEASURE RITE, INCORPORATED

Subsidiary of Badger Meter Mfg. Company
4545 W. Brown Deer Rd. • Milwaukee 23, Wis.

RECREATION

How to Equip Your Parks and Playgrounds

414. A handsome 60-page illustrated catalog showing a full line of extra heavy duty playground, park picnic and dressing room equipment, plus many related items, is now available from American Playground Devices Co., Anderson, Ind. Complete specifications, construction features, prices and details of labor and materials needed for installation are included. Check the reply card.

STREETS AND HIGHWAYS

Bitumuls Paving Handbook

Fall of Useful Data

33. The latest edition of the Bitumuls Paving Handbook covers a wealth of practical data on paving methods and materials, road and airport paving specifications and construction details, complete tabular data on asphaltic binder applications and aggregate requirements, condensed Asphalt Institute specifications plus data on Laykold compounded asphalt for flooring, tennis courts, protective coatings and waterproofing. You can have a copy by checking the reply card. American Bitumuls & Asphalt Co., 320 Market St., San Francisco 20, Calif.

To Avoid Paint and Coatings Errors

38. First consult "A Catechism on Categories of Corrosion," a pocket sized brochure that enables you to share the expert knowledge of Hercules Powder Co., Cellulose Products Dept., Wilmington 99, Del. Finding out is free; not knowing could be costly.

Don't Stand There Figuring!

31. Use the new Forney PSI Calculator "slide rule" for concrete products that includes instant conversion data from total load to psi on 17 standard test specimens and masonry units. Pocket size. Free. Address Forney's Inc., Tester Div., Box 310, New Castle, Pa.

How Are Your Bridge Floors?

183. If you face replacements—or plan new bridges—you will find much really helpful data on steel-mesh bridge flooring, safety features, frictional surfaces, dimensions, weights, loads and spans in a new booklet offered by Irving Subway Grating Co., Inc., 50-09 27th St., Long Island City 1, N. Y. Includes detail drawings, specifications, also data on bridge sidewalks. Write for "Irvinco Decking" booklet today.

Illustrated Specifications on Brush and Limb Disposal

222. A new booklet on the modern approach to the brush problem shows how an Asplundh chipper reduces bulky branches and brush trimmings to chip size for mulch or easy removal. Write Asplundh Chipper Company, 501 York Road, Jenkintown, Pa., or use the handy reply card.

Heavy Duty Air Cooled Engines For Many Uses

223. Power and weight specifications, dimensions and uses are fully covered in literature issued by Wisconsin Motor Corp., Milwaukee 46, Wis., on their air-cooled engines. Also available is a service map and a list of their distributors and approved service stations.

Rubber Roads

Are Now a Reality

230. Ramflex, a free-flowing, devulcanized rubber specially prepared to be used in combination with asphalt for highway paving applications is described in illustrated catalog from U. S. Rubber Reclaiming Co., Inc., P. O. Box 365, Buffalo 5, N. Y. Check the reply card.

Reinforced Concrete Cribbing for Highways and Embankments

267. Typical wall sections and details of standard units of open or closed face concrete cribbing are covered in catalog from American Marietta Co., Concrete Products Div., American-Marietta Bldg., 101 East Ontario St., Chicago 11, Ill. Check the reply card for general specifications and installation of the cribbing.

Badger
*Read-o-Matic's**
cost-cutting story is
big as all outdoors



*Pat. applied for in U.S.A.
and foreign countries.

All over the country water departments are cutting meter-reading costs and increasing efficiency with Badger Read-o-Matic outdoor meter-registers.

Accessibility is the big advantage of this self-contained register. Read-o-Matics are installed *outside*, often in convenient "reading stations" which a meterman can read quickly and easily. This system is safer, too, because it completely eliminates the dangers involved in climbing down into underground vaults and other inconvenient locations.

Install this faster, lower-cost reading system in your water department. Write for literature or call your Badger representative for a demonstration.



Badger Meter Mfg. Co.

4545 W. Brown Deer Rd.
Milwaukee 23, Wisconsin

To order these helpful booklets check the reply card opposite page 34.

BANOX®

... low-cost protection against
salt-slush corrosion



Rock salt for snow and ice control on roads and streets is both effective and inexpensive. But its corrosive action can turn minor scratches into costly scars. Every metal surface is a prospective victim—cars, trucks, bridges and other public structures and equipment.

Banox provides the easy, low-cost answer to this problem, for Banox, mixed with salt, effectively inhibits harmful salt brine corrosion.

Remember these facts about new formula BANOX:

BANOX IS EFFECTIVE: This has been proved in action by the many communities who have used Banox for years, as well as by extensive laboratory tests.

BANOX IS INEXPENSIVE: Only one pound is needed with each 100 pounds of salt. Although cost will vary, it averages only a few cents per capita per year.

BANOX IS EASY TO USE: No special mixing is needed. Normal traffic movement distributes it evenly along roads and streets.

Find out more about safe, effective Banox. Write for your copy of the Banox booklet. Make winter driving in your city corrosion-free, and complaint-free!

CALGON COMPANY
HAGAN CENTER, PITTSBURGH 30, PA.



DIVISION OF HAGAN CHEMICALS & CONTROLS, INC.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem, reduce troublesome brush and trimmings to tiny, easy-to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass.

Hydra-Drives

Power Shift Transmissions

283. With four speeds forward and reverse, the Hydra-Drives is ideally suited for vehicles which must travel in both directions during a normal work cycle. Check the reply card or write Rockwell-Standard Corp., Transmission and Axle Div., Detroit 32, Mich., for full details.

How to Get

Better Concrete Bonding

307. Whether your problem is bonding old to old concrete, new or fresh concrete to old concrete, or remedial patching and anti-skid surfacing, there is help in a very new informative booklet on Thiokol liquid polymer epoxy concrete adhesive. Just write Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N. J.

Power-Controlled

Motor Graders

338. Three models of motor graders with torque converters and power shift transmissions are described in detail in bulletins, No. HWG-521 and HWG-508 available from the Huber-Warco Co., Marion, Ohio.

Prompt Service on

Sweeper Refill Fibers

367. Here's a dependable source of power sweeper refill fibers, including domestic and imported types and gutter broom wire. To get all the data write A. Steiert & Son, Inc., Hatfield, Pa., or use our reply card.

How Warn Hubs Add Convenience to 4-Wheel Drive Vehicles

383. Warn locking hubs add versatility to 4-wheel drive vehicles, make it easy to shift to free-wheeling 2-wheel drive that cuts front end wear, eases handling and steering, reduces gear whine. Warn hub models fit all leading 4-wheel drive trucks. Get Form DC559-5 from Warn Mfg. Co., Inc., Riverton Box 6064-DC, Seattle 88, Wash., by checking reply card.

Everybody Else May Have Automotive Battery Problems—

401. ... except those who have read the Leete-Neville folder on their alternator-generator systems, and those done something about it. Have had trouble by taking the trouble to write for these bulletins, to The Leete-Neville Co., 1374 East 31st St., Cleveland 3, Ohio, or ring the card-number.

Self-Propelled

Ditching Machines

438. Information on a self-propelled one man operated ditching machine, model 324 T, model W-2 and a new midget ditcher, model 4 T, for light construction is now available from the Vermeer Mfg. Co., Pella, Iowa. The Model 324 T digs 8 to 24 inches wide and down to 6 feet deep, while the model 4 T digs 6 to 14 inches wide and down to 4½ feet deep. Model W-2 Ditcher digs from 2" wide up to 4" down to a depth of 30". Full data on these ditchers available by checking the reply card.

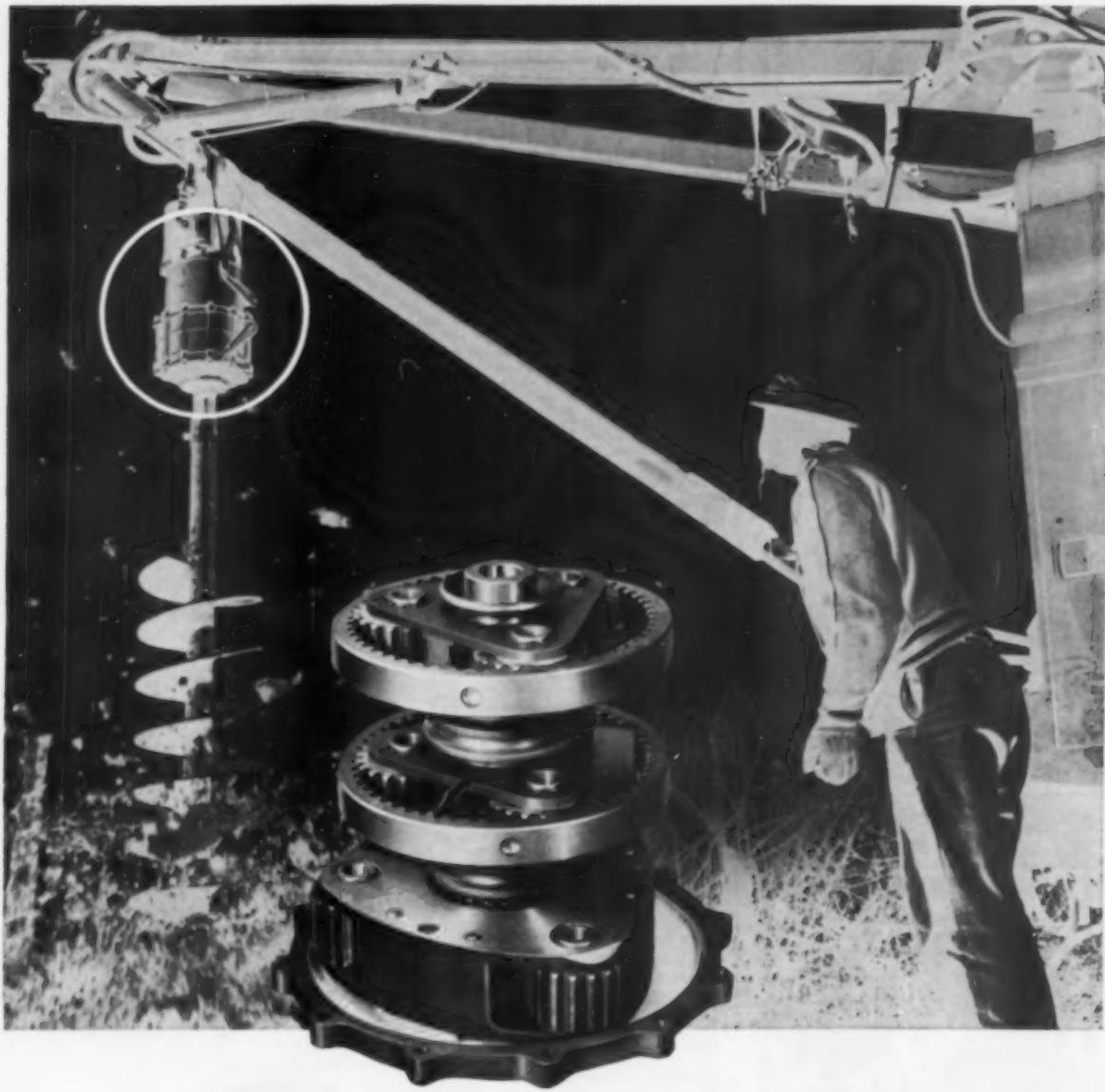
1961 Truck Line Story

From Chevrolet

446. The 1961 Chevrolet truck line is described fully in literature from Chevrolet Motor Division, General Motors Corp., General Motors Building, Detroit 2, Michigan. Check the reply card for data on this line of 165 models.

What's New in Sweeper Broom Renewals? . . . This!

509. Real speed in sweeper broom renewals is offered with the Radax broom coil, a ready-made refill that uses long wearing plastic filament. Prefabricated units are compact to store, easy to slip onto broom core. Get the details on this new approach to the renewal problem by writing Rynal Corp., 114 St. Joseph St., Arcadia, Calif., or use the inquiry card.



What goes on in here?

It's what goes on inside the compact housing of Holan's 5400 Earth Borer that makes it the most powerful derrick-suspended digger in the field.

It's here that Holan's exclusive planetary "gear train" takes power from the hydraulic motor and harnesses it for the toughest digging.

The first and second planets are engaged for normal digging. The third planet is added to the "train" for boring in frozen or rocky soil — enabling the digger to develop 8,400 pounds of torque.

Two levers operate the gears. For spin speed, only the first planet is engaged by pulling up the speed selection lever with a lanyard. When released, a spring-loaded shifting fork returns the borer to two-planet operation for normal digging. The high-torque planet is engaged to work with the first and

second planets by a second shifting fork located lower on the housing.

Holan's "gear train" use of the planetary system gives you fast spin, normal digging, and 8,400 pounds of torque with augers up to 30" — all in the same digger. And it can be used on any Holan derrick except the Model 25C.

Look into the 5400 (patents applied for) before you buy any digger. Write us — or call your Holan Field Representative — for complete details.

Holan Corporation, 4100 West 150th Street, Cleveland 35, Ohio
Plants in: Cleveland, Ohio; Griffin, Georgia; Phoenix, Arizona

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To order these helpful booklets check the reply card opposite page 34.

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Pavement Sealer Protects and Preserves Asphalt Pavement

438. Parking lots, airfield runways, driveways and playground areas are places where Koppers pavement sealer can be used. Check the reply card or write Koppers Co., Inc., Tar Products Div., Pittsburgh 19, Pa., for data on this easy to apply sealer.

Versatile Trenchers Mount On Jeeps or Tractors

394. "Gear-Draulic" boom-type trenching attachments by Auburn mount on tractor or jeep, give new utility to your equipment. Get descriptive brochures from Auburn Machine Works, Inc., Auburn, Nebraska. Use the inquiry card.

For Soil Sampling and Pavement Coring

576. There's an easier way to do both with Acker equipment. Bulletin 26-R describes a kit containing 12 different soil sampling tools. Bulletin 40-R tells about the All-Purpose auger for all types of sub-surface exploration. Bulletin 706-R illustrates the Acker Shear Test Kit for in-place shear tests in soft areas. Name the ones you want. Acker Drill Company, Inc., Box 830, Scranton, Pa., or check our card.

Design of Concrete Pavements For City Streets

657. Sections covered in this manual are classes of streets as to traffic, quality of concrete, working stress and safety factor, types of pavement design, design procedure, jointing of municipal pavements and use of distributed steel. Check the reply card or write Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill.

SNOW AND ICE CONTROL

Uniform Salt Spreading Seves Material

42. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on their spreader and table of material application rates. Use reply card or write Tarco Mfg. Co., Dept. FW, Saratoga Springs, N. Y.

Bare Pavement Maintenance With Sterling Rock Salt

84. Handbook is designed for road maintenance men who are responsible for safe winter pavements; and is a safe-roads fact book about a modern snow and ice removal program. Check the reply card or write International Salt Co., Inc., Clarke Summit, Pa.

Catalog on Tractor-Driven Tailgate Spreaders

182. Highway Equipment spreader spreads in the echelon pattern for ice control and the blanket pattern for seal coating. For literature write Highway Equipment Co., Dept. H41 616D Ave. N. W., Cedar Rapids, Iowa.

Save on Winter Ice Control Cost

237. . . with the faster-working salt described in this new Bulletin B-1159S. Tells what this salt will do and why, and where to get it. Also the bonus you get from using salt for summer road stabilization projects. Address Morton Salt Co., Industrial Div., 110 N. Wacker Drive, Chicago 6, Ill., or use our card.

No Idle Trucks with these Spreaders

397. New 8-page catalog gives features, specifications, users' statements on the Fox Mountable spreaders, equally good for sand, cinders, chips, salt, calcium chloride. Designed for one-man operation and year-round use. Wide widths and high speeds. Mounts on demounts in 15 minutes. Write Fox River Tractor Co., Box 469, Appleton, Wis., or check our card number.

With Snow Coming Soon

449. You will find special interest in the new Wausau SNO-THRO rotary snow loader bulletins just published. Address Wausau Iron Works, Wausau, Wis.

Hydraulic Controls Make Snow Plowing Easier

368. Hydraulically operated power controls may be readily installed on trucks that will plow snow this winter. Start preparing now to make winter maintenance an easier job. Get illustrated folder from Monarch Road Machinery Co., 1331 Michigan St., N.E., Grand Rapids 3, Mich. Use the inquiry card.

Winter Road Maintenance With Calcium Chloride

386. This bulletin contains data on why calcium chloride mixtures work better, how and in what percentages to store, mixing methods and recommendations for various storm conditions. Check the reply card or write Columbia-Southern Chemical Corp., One Gateway Center, Pittsburgh 22, Pa., for your copy.

Ice Control Without Corrosion Dangers

439. Virtually all corrosion is prevented when rust inhibitor "Banox" is used in conjunction with salt for snow and ice control. Properties of this material and performance results are described in bulletins issued by Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa.

How to Make Icy Surfaces Safe

433. A bulletin on how calcium chloride works in ice control and direction for its use has been made available by Wyandotte Chemicals Corp., Michigan Alkali Division, Wyandotte, Michigan. Other uses of calcium chloride are fully outlined.

Catalog on Equipment For Ice and Snow Control

468. Information on Baker snowplows and Flink ice control spreaders is available from The Flink Co., Dept. 5613, Streator, Illinois. Fully covered are reversible and one-way plows with hydraulic power lifts to meet every specification and single or dual spinner type spreaders. For reference catalog #110 check the reply card.

Plan for Bare Pavements All Winter

470. Helpful folders on clear pavement winter maintenance by use of chemical mixtures are offered by Solvay Process Division, Allied Chemical Corp., 61 Broadway, New York 6, N. Y. Circle number on reply card.

All-Weather Spreader for Standard Dump Trucks

472. Get data on the new "Rollgate" hydraulically driven roll-type spreader that applies uniform amounts of salt, sand, cinders or other materials up to 1 inch diameter over an 8-ft. width. Write Good Roads Machinery Corp., Minerva, Ohio, or check the inquiry card.

The Vital Link for Your Snow Plows

491. A plow is useless until it is hitched to truck or tractor. Versatile hitching equipment described and illustrated in circular offered by Kasten Mfg. Co., Allentown, Wis. Write them or check card number for your copy.

Formulation for use in Thermal Snow and Ice Removal Systems

493. The properties and advantages of Dowtherm SR-1, a heat transfer fluid, and typical installation layouts are covered in catalog available from The Dow Chemical Co., Midland, Mich.

Salt, Sand and Cinder Spreaders

532. . . are fully discussed in folder outlining how these are dump body mounted for quick attachment and detachment according to service and season. Basic specifications outlined. Just address Baughman Mfg. Co., Jerseyville, Ill. or use the reply card.

Snow Plows For Snow Control

539. V-type one-way and reversible plows with hydraulic hoist and having a plowing width of up to 9½ ft. are described in literature from Gledhill Road Machinery Co., Galion, Ohio. For models, specifications and features check the reply card.

BRUSH DISPOSAL CREWS OPERATE FULL TIME WITH THE TROUBLE-FREE



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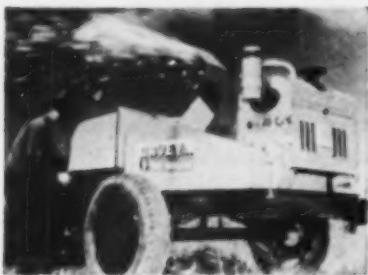
This low-maintenance Fitchburg Chipper is disposing of brush in the City of Holland, Michigan.



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"Our men have been particularly pleased with their Fitchburg Chippers . . . they are rugged and reliable."

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When crews go out to trim trees, it's costly to have machine breakdown. That's why foresters, park superintendents, line clearing supervisors, and tree companies prefer the Fitchburg Chipper. This well-engineered brush chipper is designed for busy, trouble-free service, no down-time.

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The Fitchburg Chipper is engineered to work fast, safely, and to be always "ready to go." It's the chipper which won't slow down your crews, lets you plan their work intelligently—saves you time and money.

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Just as valuable to your city's pipelines as jet engines are to airlines—this is the Centriline machine. Its job, bringing new life to small, vital transmission and distribution lines.

Specifically, a Centriline crew using this machine lines pipes of 4" to 14" diameter with a coating of cement mortar, to end tuberculation and corrosion. Other Centriline equipment revives old pipes up to twelve feet in diameter.

Once cleaned and Centriline'd—in place—carrying capacity of pipes is often greater than when they were new. Pressure goes up, pumping costs go down, and all at a fraction of the cost of laying new mains.

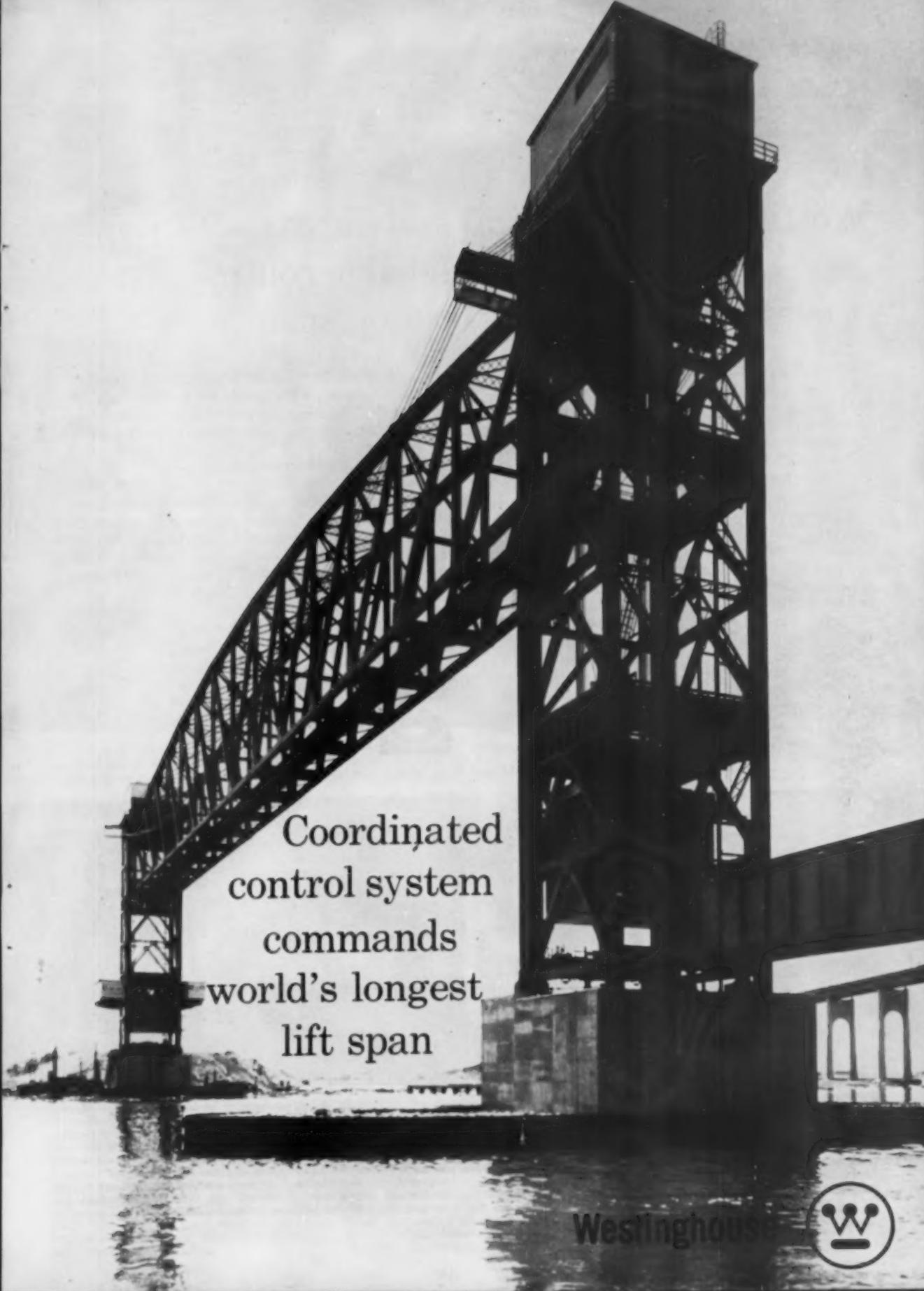
Over 7 million feet of pipes have been Centriline'd while still underground, which goes a long way toward proving the value and economy of the process. Note also that Centriline service is complete, from initial cleaning to the final proving out. Write for our illustrated brochure which shows in detail how Centriline can help save lines that might otherwise have to be completely replaced.

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Coordinated
control system
commands
world's longest
lift span

Westinghouse



ON COVER: The Arthur Kill Lift Bridge between Staten Island, N. Y., and Elizabeth, N. J., was designed by Parsons, Brinckerhoff, Quade & Douglas for The Staten Island Rapid Transit Railway Company (a wholly owned subsidiary of The Baltimore and Ohio Railroad Company) and built by American Bridge Division of the United States Steel Corporation. 1645 feet long over-all, the bridge is shown with its 558-foot central span in raised position.

Westinghouse electrical system gives precise, reliable control over vertical lift of 2,000-ton span

The new Arthur Kill Bridge boasts the longest vertical lift span ever constructed. The record length span replaces an old swing bridge whose center pier had become a navigational hazard. Westinghouse equipment quickly and smoothly elevates the span 104 feet to leave a 500-foot-wide clear navigation channel for the passage of ships—lowers the span for rail traffic.

Suspended between two shore towers, the counterweighted main span is operated by giant cable sheaves driven through reduction gearing. Measuring 558 feet in length and weighing four million pounds, it can be raised or lowered through its 104-foot travel in approximately two minutes. The d-c adjustable voltage drive, furnished by Westinghouse, gives precision speed control and holds skew of the span to a minimum throughout the normal operation cycle.

Smooth acceleration to maximum speed and gentle controlled retardation to stop give the bridge every assurance of a long and useful life with a minimum of maintenance. Standardized d-c mill motors furnish drive power for span operation. Heart of the

precision speed control is the Westinghouse Magamp exciter regulator. This simplified design uses the completely static Magamp and a single field rotating exciter to provide top performance with extremely low maintenance.

Drives in each tower are synchronized by a sensitive skew detection scheme which uses static elements to automatically reduce voltage to the leading motor and increase voltage to the trailing motor. This system can be expected to keep the two ends of the lift span within close limits of being perfectly level throughout its travel. To assure bridge operation under emergency conditions, a stand-by diesel engine generator set is installed. A duplicate drive system is also provided and is available at the option of the bridge operator at any time.

(cont'd)

J-94150-2



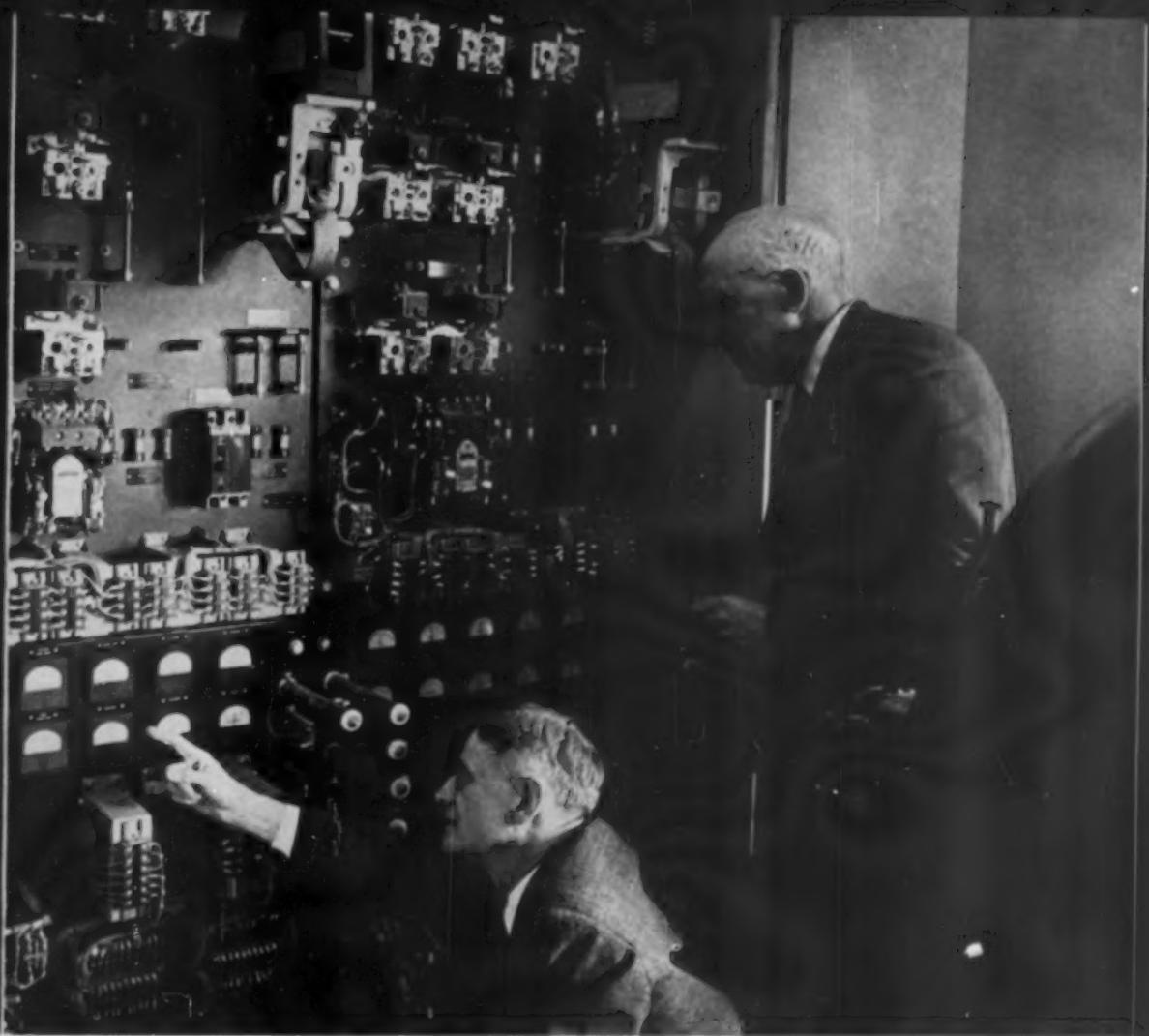
Westinghouse



View of main control room in east tower, showing desk from which operator controls all main and auxiliary bridge drives. Special instrumentation, including height and skew indicators, keeps bridge tender informed of all operating conditions. Drive system transfer and power source selection is made from this console. W. C. Carl explains conveniently grouped controls to N. L. Ziegler, Division Engineer (left); J. F. Stevens, Superintendent; and P. K. Partee, General Manager.



Discussing main drive equipment in east tower are M. B. Trimble, Westinghouse Construction Engineer; G. R. Keltie and W. C. Carl. Two type MCPA-614, 135-hp Westinghouse mill motors are shown above—one motor for each of the duplicate drive systems. Systems are arranged so that one motor in each tower can drive span at rated speed. These rugged, heavy-duty, standardized motors assure reliable operation under all conditions. Westinghouse type HI-198 thruster brakes are used for holding bridge at standstill.

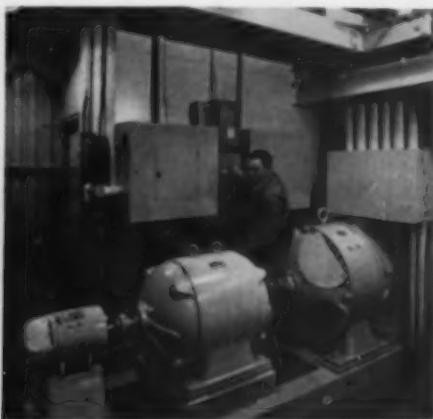


G. R. Keltie, Chief Substation Maintainer, The Staten Island Rapid Transit Railway Company, looks on as W. C. Carl, Westinghouse Construction Engineer, points out details of

main d-c control panel. This panel contains type M, 800-amp d-c "loop" contactors, span speed, current limit and skew control Magamps with associated auxiliaries.



Incoming 4160-volt power is reduced to 480 volts by this 500-kva Westinghouse power center. Low-voltage switchgear at rear distributes power to main drive system and bridge electrical auxiliaries. Type DB drawout air circuit breakers provide feeder circuit protection. Discussing installation: John Pucillo, Staten Island Rapid Transit Railway Electrician; Max Pilger, Garfunkel Electric Supply Company; and M. Davis, Westinghouse Sales Supervisor.



John Pucillo is seen operating wall mounted AB-I breaker which controls machinery and room heaters. In foreground, main 125-kw type SK d-c adjustable voltage generator driven by 150-hp type CSP® motor. Generator excitation furnished by Magamp exciter regulator determines operating speed of main drive motors. Small unit at near end is a constant potential generator for drive motor fields and control auxiliaries. The d-c supply for duplicate drive system is furnished by identical equipment.

*Trade-Mark



A Westinghouse control center in the east tower switchboard room is examined by Messrs. Partee, Carl and Ziegler. It contains combination starters for 440-volt auxiliary drives and includes a-c relay panels at each end. Compact control centers are composed of interchangeable, space-saving, easily installed modular units.

J-94150-8



Coordinated control system commands world's longest lift span (cont'd)

As supplier of the coordinated electrical systems, Westinghouse assumed complete responsibility for their performance. For more information about how this single-source supply can benefit you, contact your nearby Westinghouse construction sales engineer. Or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

OWNER: The Staten Island Rapid Transit Railway Company (a wholly owned subsidiary of The Baltimore and Ohio Railroad Company), Staten Island, N. Y.
CONSULTING ENGINEER: Parsons, Brinckerhoff, Quade & Douglas, New York, N. Y.
GENERAL CONTRACTOR: American Bridge Division, United States Steel Corp., Pittsburgh, Pa.
ELECTRICAL CONTRACTORS: Fischbach and Moore, New York, N. Y.
Lightning Electric Service Co., Newark, N. J.
WESTINGHOUSE DISTRIBUTOR: Garfunkel Electrical Supply Co., Jersey City, N. J.

Interesting view from mezzanine floor, showing one of four span control auxiliary assemblies. A single machinery take-off to the multiple speed gearbox provides correct ratios to operate type A cam limit switches, height, skew and control transmitters. This construction permitted unit preassembly at machinery builder's plant—assuring fast, easy installation. Seen above: W. C. Carl and G. R. Keltie.

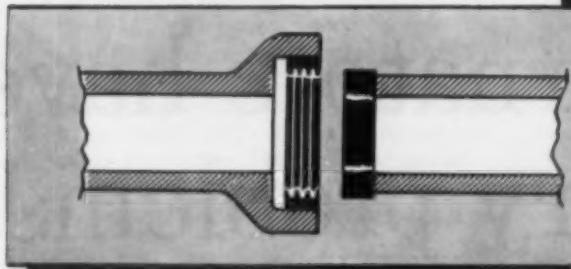
Freight train moving over the recently completed Arthur Kill Lift Bridge is drawn by a diesel engine of The Staten Island Rapid Transit Railway Company.



Westinghouse

J-94150-4

**Couples in Seconds...
Seals Water-tight**



UNIVERSAL **Flexible-Coupled** **VITRIFIED CLAY PIPE**

Seconds after this photo was snapped, the length of Universal Vitrified Clay Pipe was tightly coupled and workmen were reaching up to steer the next pipe home. Each joint, as it was coupled, sealed water-tight, automatically, and required no further handling.

This is the performance engineers and contractors can rely upon for *any* waste disposal project they plan and build with Universal *Flexible-Coupled* Vitrified Clay Pipe. A look at the diagram tells why . . .

It takes only seconds to seat the spigot of the pipe into the multiple-ribbed sealing ring integrally built into the bell. The ribs grip the spigot by compression, yet being made of either rubber, neoprene or P.V.C., provide ample flexibility to allow for pipe angularity, soil stresses or over-burdens, with no danger of breaking the watertight seal.

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6099

OWNER: Elizabeth Township, Allegheny Co., Pa.
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CONTRACTOR: Golden Triangle Construction Co.,
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Take a tour of Columbus, Ohio...

where Leece-Neville alternators have ended battery problems!



The fast, never-resting pace of patrol cars and emergency wagons in the Columbus Police Department necessitates replacement every 12 to 16 months. According to Sgt. Harry M. Buckner, who heads up police vehicle maintenance, "About 145 of our units are Leece-Neville alternator equipped. We transfer the alternators from old cars to new ones as they are purchased, and one alternator usually outlives three cars."



"**Leece-Neville alternator** systems have been the answer to our battery problems," report Horace J. Swain, Traffic Equipment Supervisor, (left above) and Walter W. Curlis, Superintendent of Municipal Garages. "Not only do they keep our batteries in operating condition at all times, but they give us exceptionally long, trouble-free service that helps keep generator and battery maintenance expense to a minimum."



Fire Maintenance Foreman William H. Miller (second from left above) claims, "We have about 100 pieces of equipment with Leece-Neville alternators—cars, trucks, squad wagons and pumpers—and they give us no trouble over the life of our vehicles. Some alternators installed in 1950 are still in service; others have gone better than 100,000 miles. These alternators keep batteries charged, eliminate the need for charger plugs on our cars, and improve radio performance on all of our units."

Columbus, capital city of Ohio, is also noted for its progressive city government, its vast land area compared to population, and its rapidly growing network of modern freeways.

Way back in 1946, when Leece-Neville first introduced the alternator-generator for automotive use, Columbus immediately installed six units for test purposes (3 are still in use). Today the city fleet includes almost 400 vehicles equipped with Leece-Neville alternators. Usage is widespread . . . in police, fire, traffic regulation, electric, water and sewer departments . . . wherever discharged

Specify Leece-Neville alternator systems as factory-installed special equipment on new vehicles.

batteries have been a problem in the past.

Alternators may solve your problem too! But be sure you specify Leece-Neville alternators, proved trouble-free during 14 years of actual service in all parts of the country. No other supplier can make this claim! For complete information, mail the coupon below. Leece-Neville also is a leading supplier of DC generators, fractional HP motors, regulators, cranking motors and switches.



20 trucks and 4 cars in Columbus' Traffic Regulation Department are equipped with Leece-Neville alternator systems. Even with a full electrical load of multiple flasher lights and 2-way radios in operation during long periods at engine idle, L-N alternators keep batteries charged.

The Leece-Neville Company, Dept. 1374 East 51 Street • Cleveland 3, Ohio

Please send me complete information about alternator systems and other products for my type of service.

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ALTITE JOINT® Protected by Patent

Ed Cleary Asks:

Why The Lag In Sewage Plant Construction?

EDWARD J. CLEARY

Diplomate, American Academy of Sanitary Engineering
Cincinnati, Ohio.

IT IS discouraging that sewage treatment works contracts this year continued at a low level, 30 percent below 1959, despite a near-record installation of collecting sewers. This was the unhappy revelation made by G. E. McCallum, chief of the division of water supply and pollution control, U. S. Public Health Service before the annual meeting of the American Public Works Association several weeks ago.

Mr. McCallum stated that this was a puzzling situation; and indeed it is. Could it be that the federal grants-in-aid program inaugurated three years ago to stimulate construction of municipal treatment works is having an opposite effect? It is quite conceivable that municipal councils are not finding it politically feasible to go ahead with the letting of contracts without first securing a federal grant. And since the amount of money allocated each year by the Congress (about \$50 million) has never matched the total requests for aid, the nation's water-pollution program is thus being paced to the availability of federal funds. This possibility was foreseen by some of those who decried the wisdom of initiating a federal-grant program for sewage treatment when the matter was debated in the Congress some five years ago.

If further experience demonstrates that municipalities are in no mood to contract for sewage-treatment installations until they have been certified eligible for federal aid, then one of the questions might be: How much money must Congress make available for municipalities to achieve an annual construction volume of \$600 million? It has been estimated by the Public Health Service that this rate of construction is required to wipe out a \$2 billion backlog of accumulated needs and to meet new needs.

One might get a clue to the answer from a study of Public Health service records. These show that every dollar of federal money allotted to municipalities for sewage projects has been matched by five dollars of local expenditure. Using this 1 to 5 ratio, it would appear that an annual federal appropriation of \$120 million might be required to sustain a \$600 million construction program.

Is Federal Aid the Sole Incentive?

However, the failure of municipalities to expedite installation of sewage-treatment works, which Mr. McCallum finds to be both discouraging and puzzling, cannot be attributed solely to the inadequacy of federal subsidies. There are too many examples of apathy—if not outright resistance—by municipalities to the fundamental proposition that the discharge of raw sewage is a social and legal offense.

It seems incredible, for example, that the citizens of St. Joseph, Missouri, in the face of repeated state efforts and now the threat of a U. S. Department of

SAFE OR SORRY

WHAT'S YOUR CHOICE FOR WINTER ICE CONTROL?

Rock Salt is safe: Rock salt never allows ice or snow to remain and form dangerous ruts. All the snow and ice is melted away or left in condition for easy mechanical removal.

Rock Salt is clean: Rock salt leaves a dry pavement. The only thing left after rock salt does its work is a harmless white recrystallized salt. It needs no cleaning up in the spring or any other time.

Rock Salt is harmless: Rock salt does no harm to people's hands, clothing, shoes or rugs. It does not affect in any way materials such as wood, rubber, leather or plastics.

Rock Salt is economical: A truckload of rock salt goes a long way; covers five times more mileage than the same truckload of abrasives—speeds road safety, saving money and time. And rock salt does not have to be spread completely over the entire road surface.

Abrasives are dangerous: Abrasives just lie there... actually retard melting by forming a crust over snow and ice. They never remove ice or snow... and they leave dangerous ruts.

Abrasives are dirty: When sun finally melts pavements clear, abrasives leave a residue which eventually dries to become clouds of dust and sewer-clogging bulk. Abrasives cause expensive spring cleanup of gutters, catch basins, storm sewers.

Abrasives are damaging: They chip paint and chrome, exposing base metal to corrosion. Tracked into buildings, they injure every kind of floor. Abrasives are hard on yards and spreading equipment, too.

Abrasives don't go far: They must be spread many times in one storm because just $\frac{1}{4}$ inch of snow will make them ineffective. Abrasives must completely cover a road—missed areas have no protection. Frequent reloading slows ice control operations.



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Justice court action, have twice refused to support the issuance of funds for financing sewage-treatment facilities. Here we have the spectacle of a community in which public opinion is not only indifferent about river pollution, but actually expresses contempt for those who are concerned. At least that is what one might gather from the record of this first test of federal enforcement effort.

The situation at St. Joseph is not unique, however, so far as citizen attitudes are concerned. Throughout this nation there are thousands of communities who have shown little disposition to participate in the common obligation of preventing water pollution.

This suggests that efforts thus far in dealing with the problem of safeguarding water resources from pollution have overlooked the obvious. The record does not show that solution of the problem will be found in devising legal prohibitions; in jockeying administrative authority among state, interstate and federal agencies; or in the size and distribution of financial subsidies. Legislation forbidding pollution has been on the statute books of all our states—on some for almost a century—but success in securing clean streams shows little correlation to the number or stringency of the laws. Nor do we yet have any evidence that accomplishments are related primarily to the choice of administrative unit. And, in the light of current developments, one must hesitate in appraising the effectiveness of federal grants in expediting performance.

Neither is it realistic to believe that progress in water pollution control must be paced to research effort and the development of further technical knowledge. Certainly it cannot be said that the city of St. Joseph, or any other municipality, has been handicapped in preventing pollution because of technological deficiencies.

Public Sentiment is Everything

From this analysis one arrives at the conclusion that lack of public willingness rather than lack of laws and technical know-how is the primary obstacle to progress. Pollution control is a type of social reform—and such reforms are brought about by a change in public attitudes. It cannot be said, however, that pollution-control efforts have been distinguished in their emphasis on motivating public sentiment for clean streams.

In this connection it is pertinent to recall a profound observation by Abraham Lincoln. Talking about the manner of achieving changes in a democratic society, Mr. Lincoln said: "Public sentiment is everything. With public sentiment nothing can fail; without it nothing can succeed."

It may be noted that in those areas of the United States where progress is being made in stream clean-up, the programs have been characterized by special efforts on the creation of public awareness and in the development of citizen support. Obviously much more needs to be done in this direction. It is gratifying to note that the Water and Sewage Works Manufacturers' Association recently inaugurated a program that should prove to be helpful. The association has sponsored the establishment of a National Water Institute. One of the functions of this institute is to conduct a nation-wide campaign on television, radio and other media of public communication pointing to the importance of safeguarding water resources through pollution control.

Another important step in dramatizing the need for a more aggressive attack on water pollution is the

White House conference scheduled for December 12-14. This is designed as a "citizens conference" in which some 1,200 participants have been invited to aid in (1) defining national goals for water pollution control; and (2) outlining specific programs to reach these goals.

Engineering Notes

Cost Data on Public Works Construction

Cost data are given in the 1959 report of E. F. Hensch, Director of Public Service, Duluth, Minn., as follows: Trenching to 6 ft. deep \$2.20 to \$1.75, prevailing \$2.00 per ft.; earth in trench \$2.00 per cu. yd., but varying from \$1.25 to \$4.00; boulders in trench, average \$6.00 per yd.; rock in trench, \$5 to \$25 per cu. yd., averaging \$16. Manholes \$2.75 average, varying from \$200 to \$525; manholes per vertical foot of depth \$47. Sawing concrete 15 cents per lineal foot. Remove and replace street sign \$10; tree removal, 8-in. and over \$30, varying from \$10 to \$60; and under 8-in. \$12 varying from \$5 to \$40.

Methods of Financing Street Lighting

In order to determine how modern street lighting was being financed, the Street and Highway Safety Lighting Bureau sent questionnaires to 500 cities. Replies were received from 412. Use of the 100 percent property assessment front foot method was reported by 55 cities; 100 percent assessment on other than a front foot basis was reported by 20; general fund financing for lights in the business area was reported by 177 cities; a combination of special assessment and general fund was used by 52 cities; and other methods by 99 cities. These data were reported by Edmond C. Powers of the Bureau in a paper before the APWA.

County Public Works Regulations for Subdivisions

In a questionnaire directed to County Engineers, the question was asked: Does your county have regulations governing subdivisions with respect to: 1) paving; 2) storm drainage; 3) street lighting; and 4) sewerage? On the first returns tabulated, 315 replies, the questions were answered by 117 counties. Of these 100 have regulations regarding paving; 96 have regulations covering storm drainage; 71 have regulations covering sewerage; in some cases these are promulgated by the Board of Health, state or local; but only 13 have regulations regarding street lighting.

Evaluation of Insecticides

The report of the Communicable Disease Center of the Public Health Service for 1959 contained interesting reports of studies on the characteristics of many insecticides.

At Chinook, Mont., observations were continued on the residual activity of DDT, dieldrin, and heptachlor on plots that had been treated with various dosages under varying conditions in 1956. The heptachlor and dieldrin retained considerable effectiveness, but neither gave complete mosquito control throughout the third mosquito breeding season. Findings for DDT were inconclusive. Trials were initiated to determine the minimal effective dosages of these

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Where it's manufactured?

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Calcium chloride-salt mixtures are effective at all temperatures and humidities. While salt's best range is 25-32°F., calcium chloride speeds melting at all temperatures, even down to below zero . . . provides the moisture salt needs to act. Calcium chloride liberates heat as it melts ice, which helps salt work faster. When you combine the two, applications can be lighter and less frequent. This reduces chemical consumption and lowers cost.

For instant skidproofing of icy surfaces, treat abrasives with Solvay Calcium Chloride. They hold fast in wind and traffic at all temperatures.

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insecticides. Preflood applications of dieldrin at 0.25 lb. per acre and postflood treatments with DDT at 1.5 lb./acre provided essentially complete control for the entire season. Preflood and postflood treatments with heptachlor at 0.75 lb. per acre gave control for 9 and 12 weeks, respectively.

Cotton cords impregnated with a 25 percent ronnel solution gave satisfactory to excellent fly control for 8 to 16 weeks in 6 dairies. After 7 to 10 weeks of excellent control, the cords were removed at two other dairies. Fly indices rose within 4 weeks but were reduced 2 weeks after the cords were reinstalled. At another dairy, two treatments with ronnel- and one with parathion-impregnated cords failed to give satisfactory control.

Commercially impregnated papers (DDT and dieldrin) used in the ICA and WHO kit for detecting insecticide resistance in adult mosquitoes retained their toxicity for 12 months when stored at 80° F. No loss in biological activity was noted after the papers had been used in 50 tests over a 1-year period. When stored at 115° F. for 5 months, only the DDT-treated papers showed a loss in toxicity. Susceptibility determinations for the kit were modified. After the initial base line has been run, the standard for susceptibility should be based on kills obtained within the 95 percent to 100 percent range. In physiologic resistance, the response of the mosquitoes remains on a plateau even when the concentration of the toxicant is increased.

Because insects in some areas are developing resistance to the organic phosphorus compounds, studies are underway on malathion-impregnated papers for the ICA-WHO kit.

Field studies on malathion suspensions as residual treatments against anopheline mosquitoes have shown considerable promise. In animal-baited huts, deposits of 100 milligrams per square foot gave complete mortality of a dieldrin-resistant strain for 12 months. Residues of 200 milligrams per square foot gave 80 to 100 percent kills of susceptible *A. quadrimaculatus* after two years.

A study was carried out in central Washington to determine the average amount of DDT and parathion residues on apples. Residue levels for DDT ranged from 0.3 to 12 ppm and for parathion from 0.01 to 0.32 ppm, with higher residual amounts for both found on unwashed samples. Values were somewhat higher than those reported by workers in previous years. Analysis of DDT in the by-products of vinegar showed varying amounts in the wet and dry apple pomace, but none was detected in the apple juice.

Studies of rodenticides indicated that, on the basis of critical dosage level and survival time of roof rats fed different concentrations of rodenticides in yellow corn meal, Diphacinone appeared to be a more effective poison than warfarin or Pival.

Control of Garbage Burning To Prevent Air Pollution

In enforcing the New Jersey air pollution control law, three of the largest operators of general refuse disposal areas in Hudson and Mercer Counties were enjoined from open burning of refuse as the result of consent judgments obtained in the courts by the Department of Law and Public Safety. One contractor who collects municipal refuse on a large scale has challenged the legality of the open burning provisions of the Code. This matter is pending resolution in the courts.

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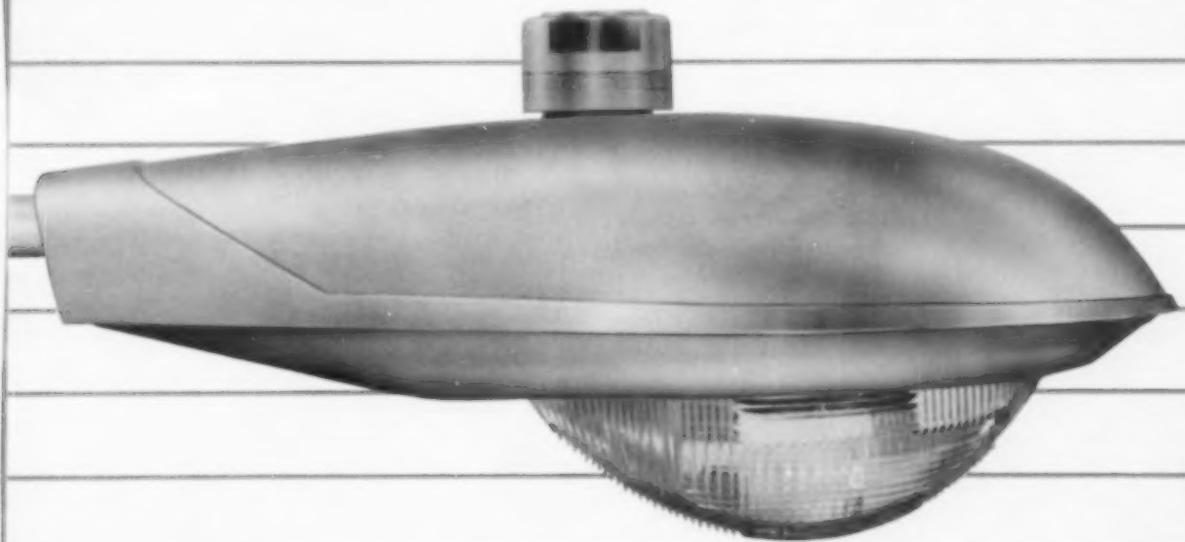
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residential lighting

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**NEW GENERAL ELECTRIC
M-250R LUMINAIRE**







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Exclusive design aims light to streets, si

Here's the residential street lighting luminaire all America has been waiting for! It's the new General Electric M-250R . . . a small, attractive, high-efficiency mercury luminaire that makes code-level residential lighting a practical, attainable goal for every community in America. Now, the taxpayers in your city *can have the type and amount of residential lighting they need—and want—on a bargain cost-of-light basis.* Here's how:

Unmatched efficiency—Instead of spraying light and brightness toward bedroom windows, the new G-E M-250R employs an exclusive, highly-efficient refractor which directs significantly more light on the street and sidewalks away from houses and lawns.

And, the new G-E luminaire, with "bonus-line" mercury lamp, delivers nearly three times the useful light six times as long as does a filament lamp and fixture of equal wattage. For example, a 175-watt M-250R yields 7000 lumens, compared to the 2500 lumens of a similar filament unit.

Unmatched appearance—It's a fact that property values are increased when streets are relighted with modern equipment. Functional, smart styling of the new G-E M-250R luminaire complements the appearance of any modern neighborhood, by day and by night.

Equally important is the fact that—with modern residential lighting—your citizens can benefit from increased safety . . . in terms of reduced nighttime crime, vandalism, fewer traffic accidents.

Unmatched economy—The cost of lighting residential streets is, when compared with other public-

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works expenditures, already the biggest bargain in the municipal budget. Now consider this new fact: You can light your residential streets to code level with a 2500-lumen filament unit every 120 feet. But, the same street can be lighted—to higher than code-level minimums—with M-250R's spaced every 240 feet . . . just half as many units!

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General Electric is making a special three-unit "Light-a-Block and SEE" package offer to electric-power suppliers for a limited time. Let them set up for you a permanent demonstration on a residential block in your community. Let everyone see the beauty of residential neighborhoods spring to life under modern lighting! Show all municipal officials the economical lighting they will want to have on every residential street. See for yourself—under controlled conditions—the many practical benefits of the M-250R luminaire.

Start the "Light-a-Block and SEE" project in your community right away, through your electric-power supplier. Your General Electric Sales Engineer or Agent will be happy to give him the details. And, for the new M-250R descriptive bulletin, write General Electric Company, Section 460-10A, Schenectady, New York.

Outdoor Lighting Dept., Hendersonville, N. C.

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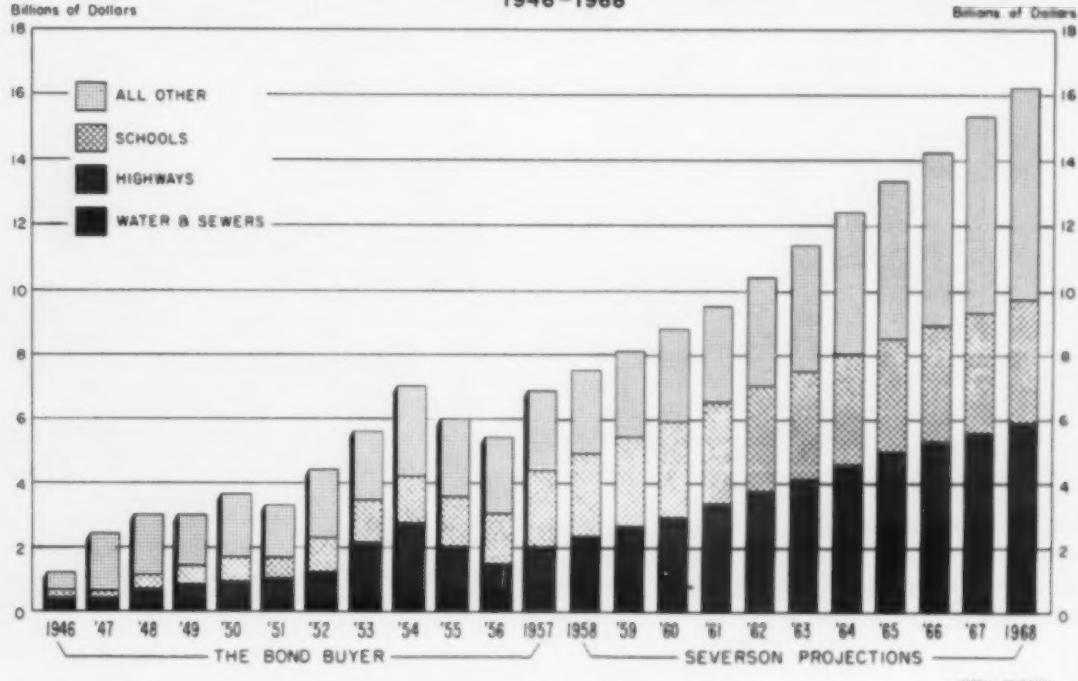
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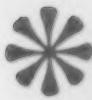
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This simple detail of design is typical of many extra features of Mueller AWWA Tapping Sleeves and Valves. It is also typical of the great attention to detail in research, design and engineering that becomes a part of every Mueller product used by the water industry. For complete information write ...



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LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Operation of City Street Maintainer

Schoenrock v. City of Sisseton, 103 N. W. 2d 649, a South Dakota case decided June 13, 1960, was an action by an automobile passenger for personal injuries resulting from the negligent operation of a city street maintainer with the automobile in which the passenger was riding.

In the trial court, the jury returned a verdict for plaintiff in the amount of \$7000. This judgment was appealed by the city on several grounds, including the defense that the maintenance of streets is a governmental rather than a proprietary activity, and hence the city should be immune from liability for negligence. The Supreme Court of South Dakota, however, refused to allow this defense on the ground that it had not been pleaded or presented to the trial court and could not be presented for the first time on appeal.

The other grounds of appeal were also denied, and the judgment was affirmed.

Thus, this case indicates that the defense of governmental immunity is not always looked on with favor by the courts, and if there is a way to get around it, the court may be glad to take it.

Sewer System Construction

Walker v. City of Cedar Rapids, 103 N. W. 2d 727, an Iowa case decided June 14, 1960, was an action against the city by an employee of a contractor installing a sanitary sewer system under a contract with the city, for injuries received when a ten-foot deep sewer trench caved in on him while he was working in it.

Dirt had been removed to dig the ditch and was piled on top, in close proximity to the ditch. Walker was engaged in caulking pipe, when

the sides of the ditch and dirt caved in, falling on him and another workman and burying both of them under about ten feet of dirt. It was minutes before the workmen were able to reach Walker and remove him to a hospital. He was seriously injured. Some of the injuries are permanent in nature. He sued the city for \$75,000.

The action was based on the alleged negligence of the city in failing to shore, brace and sheet the sides of the ditch, and to warn Walker of the danger, and in failing to require the contractor to brace the sides in accordance with the contract.

The court held, however, that "reservation of the right to supervise and inspect for the purpose of seeing that the work conforms to contract specifications does not make the municipality liable for the contractor's negligence."

The court held, further, that the city was immune from liability even if it was negligent, because the installation of sanitary sewers is a governmental function because it pertains to public health. Thus, the rule of governmental immunity was reaffirmed in this Iowa case.

Consequently, the plaintiff was denied all relief against the city.

Cast Iron Sewer Pipes

McGraw-Edison Co. v. Sewerage Commission of the City of Milwaukee, 104 N. W. 2d 161, a Wisconsin case decided June 28, 1960, was an action for a declaratory judgment declaring that a joint rule of the city and county sewerage commissions requiring that all house sewers thereafter connected to sanitary or combined sewers must be made of extra heavy cast iron soil pipe, was invalid.

The rule was adopted as a result of a study on water pollution in the area. As the result of that study, it



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It's r-r-really c-cold out! Temperatures below zero and streets are slick with packed snow. That means trouble with a capital T...not only for motorists, but for spreading equipment. Stockpiles of sand freeze up...get so you're loading lumps that can really play havoc with most spreaders. If you use cinders or bank-run aggregate the problem is constant.

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was found that clear water entering the sewerage system through house sewers at many times interfered with the operation of the sewage disposal plant, caused backing up of sewage in home basements, required by-passing of partially treated or raw sewage into the water courses and added greatly to the cost of the operation of the system. The state authorities therefore issued an order to the Sewerage Commission of Milwaukee requiring them to take steps to eliminate as far as possible the infiltration of clear water into the system. The City Commission then applied for authority to adopt joint rules with the county, and the legislature enacted a statute authorizing the adoption of joint rules. A study by an independent firm resulted in the recommendations which were adopted as this joint rule, requiring cast iron soil pipe for all house or building sewers subsequently connected to sanitary or combined sewers.

The plaintiff was a manufacturer of bituminous fiber pipe in Wisconsin, and sought to enjoin this rule before it became effective.

The evidence at the trial showed that there were some soil conditions in which the acidity would cause corrosion of cast iron pipes, and that in those cases cast iron pipe should not be required. As a result, the court declared that the rule was arbitrary and unreasonable, and was therefore unconstitutional. The Supreme Court of Wisconsin indicated that if the rule had contained an exception in those cases in which cast iron pipe was not suitable, the rule would have been valid even though its effects might be to decrease the sale of the product.

• • •

Cutting the Cost of Leaf Collection

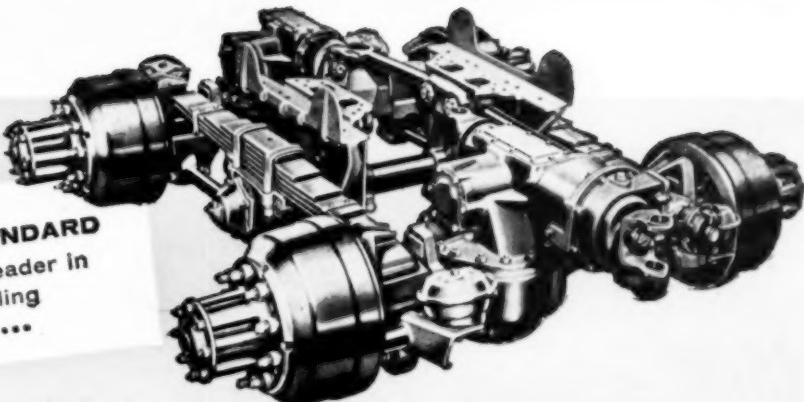
During the year a new Obeco leaf loader was purchased by Merced, Calif., to accelerate the leaf collecting program. A total of 2,976 miles was traveled. The equipment was also used to clean debris from around power poles and buildings in alleys at a cost of \$1.06 per mile. With this new method of collecting leaves, only two men were required to do the job during the entire leaf season at a cost of \$2,720, which includes labor and equipment. The old method of leaf collecting required the use of three trucks, one loaded, one rubber tired tractor with a leaf pusher attachment and five men. A net savings of \$3,250 was realized in the new operation.

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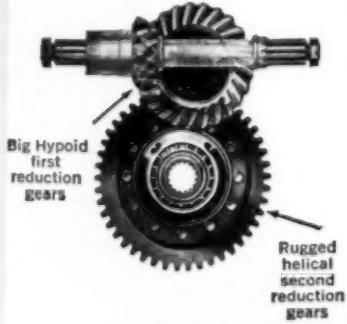
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Timken-Detroit Heavy-Duty Tandems with Hypoid Helical Double-Reduction Gears
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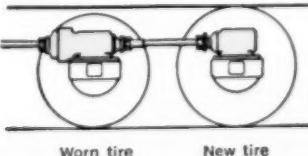
Rugged Hypoid-Helical Double-Reduction Gearing!

Balanced gearing—with two full-sized gear sets working in series to take an equal share of the load—provides a stronger power train with balanced gear set loadings and the widest range of ratios.



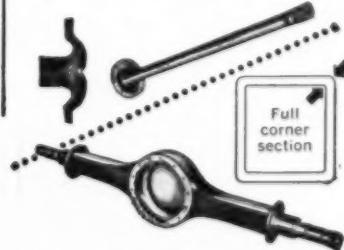
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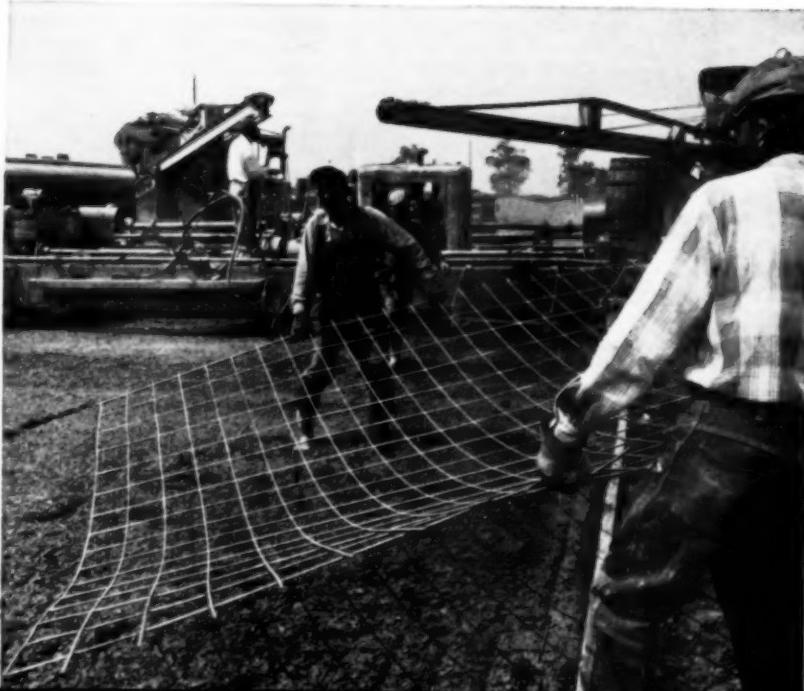
Transmission and Axle Division, Detroit 32, Michigan





Steel reinforced

...to stand up



PROJECT: Portion of North Expressway just west of Cumberland Avenue Interchange, Cook County, Illinois

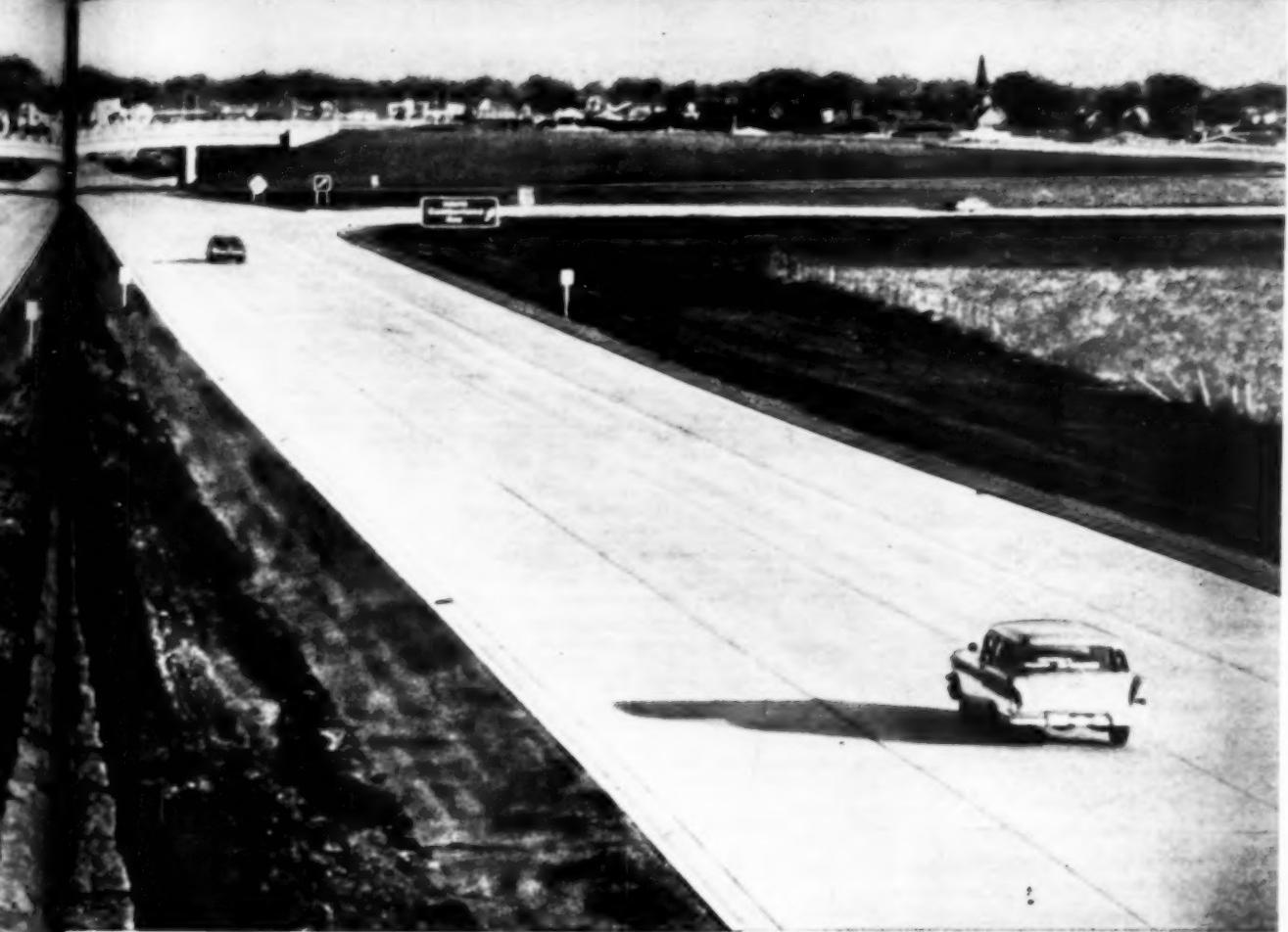
OWNER: Cook County Department of Highways

CONTRACTORS: Arcold Metal Corp., Evanston, Illinois

WIRE FABRIC DISTRIBUTOR:
E. W. Zimmerman, Inc., Chicago, Illinois



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a product is made of modern,
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d up under the hi-speed pounding of modern traffic

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An anticipated daily count of 31,000 vehicles is expected on this newly opened 4½-mile section which extends from Foster & Central Avenues to the Illinois Toll Highway. This figure indicates what this already busy strip will be subjected to as the traffic load gets heavier. And it points up the importance of building into all new roads and highways the strength it will take to stand up under the almost ceaseless pounding of modern hi-speed traffic in the years ahead.

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THE BUMP AT THE BRIDGE . . .

WILLIAM S. GARDNER, P.E.

Woodward-Clyde-Sherard and

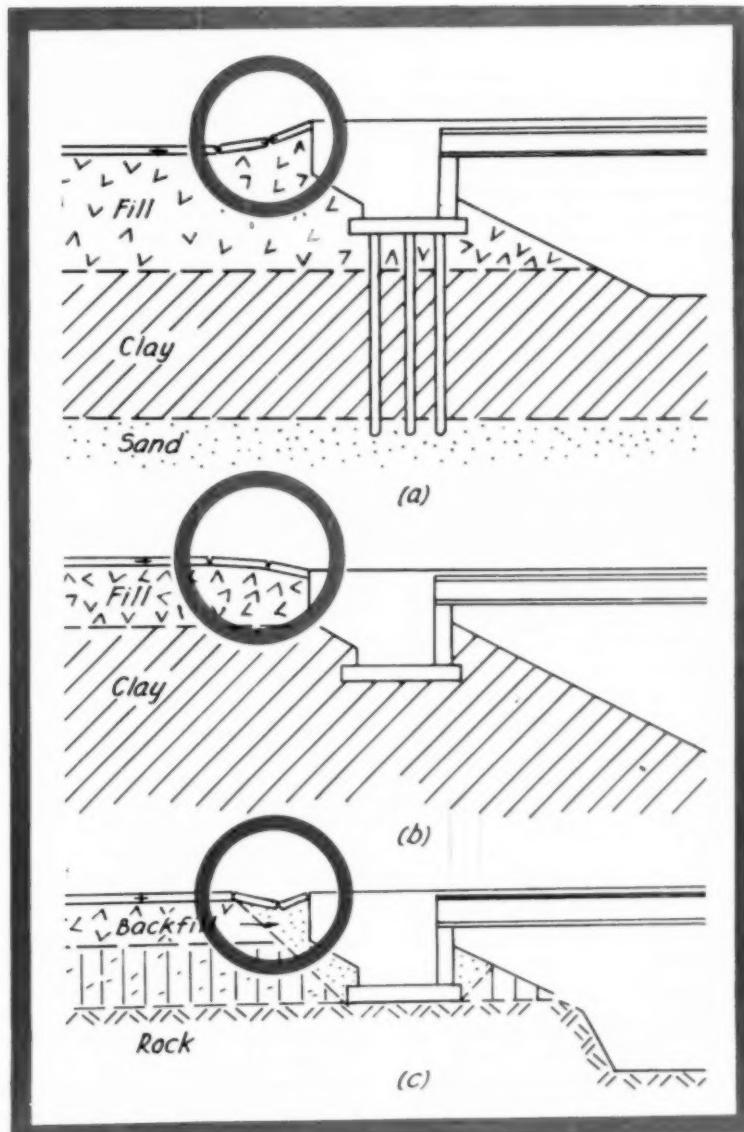
Associates

Philadelphia, Pennsylvania

THERE is one outstanding flaw common to many of our modern, otherwise well-engineered highways. This shortcoming is quite evident to the motorist after he has crossed a highway bridge and has been jolted by a dip, bump or crack in the pavement at the bridge approaches. This condition brings two questions to mind. Why does roadway pavement crack and warp at a bridge approach? Is this pavement distress inevitable in highway bridge construction? The answers to these questions are of increasing importance in this era of accelerated highway construction, typified by the limited-access highway and the grade separation. This problem requires the attention and coordination of engineers concerned with the design and construction of highways and highway bridges if the overall smooth riding qualities so necessary to our modern high speed highways are to be achieved.

Approach Pavement Distress

Why does roadway pavement crack and warp at a bridge approach? The introduction to the cause and effect of pavement warping at the bridge approach is best presented by reference to Figure 1. Figure 1 (a) demonstrates a common cause of pavement warp and its characteristic "bump." Relatively deep incompressible foundation soils are shown to be overlain by soils subject to appreciable compression under load. The bridge abutment has been founded on piles, which pass through the stratum of compressible clay and bear on the



● FIGURE 1. Three differential settlement conditions which bring about pavement warping at bridge approaches. Suggested solutions are outlined in the text.



● ADEQUATE compaction within the confines of this bin-type abutment presents obvious difficulty. Selected fill materials and good field control are necessary.

underlying relatively incompressible sand. Pavement distress has developed after construction. The clay soils have consolidated under the weight of the embankment fill, while the abutment—supported by piles bearing in the sand—has remained fixed. An additional factor adding to the embankment-bridge differential settlement, illustrated by Figure 1 (a), is the consolidation of the embankment fill itself. Improperly placed embankment fill, subject to stresses imposed by their own weight, will consolidate similarly to the underlying compressible foundation soils.

Figure 1 (b) shows a less common condition; both the embankment and bridge abutment are founded on compressible clay soils. Post-construction subsidence of the bridge abutment is greater than that of the approach embankment. The differential settlement has developed because of unequal stresses induced in the compressible foundation soils by the greater loading of the bridge abutment.

Figure 1 (c) represents an all-too-common condition; the granular backfill behind the bridge abutment has been inadequately compacted and its subsequent densification and subsidence under repeated traffic impact and vibration, has resulted in distress of the approach pavement.

What Is Consolidation?

A generalized understanding of the concept of consolidation of foundation soils under load is necessary to appreciate the phenomena of post-construction subsidence, as well as the methods for solution of this problem. Primary consolidation, generally the major cause of sub-

sidence, occurs when there is a reduction in the volume of the foundation soils under stresses induced by construction loadings. The volume decrease (settlement) progresses as water and air, filling the soil voids, are expelled from the stressed zone. This process continues until the soil structure, by its increased grain contact, is able to support the entire induced load. The rate of primary consolidation is controlled by the permeability of the soil, the thickness of the compressible stratum, and the boundary drainage conditions, as well as by the loading intensity, rate and distribution. The consolidation of thick deposits of impervious, compressible, clayey soils under embankment or structure loadings, may not be complete even after a period of several years, while consolidation of pervious, predominantly granular soils, is rapid and is often complete by the end of the construction period. Relatively impervious clayey soils are therefore, usually the worst offenders, progressively consolidating for long periods after construction.

Although granular soils generally are subject to almost immediate consolidation under imposed loads, they are also subject to long term progressive densification under vibration and repeated impact. The effect of repeated impact on granular soils is not well known. This phenomenon, however, becomes of great importance when granular soils, used as abutment backfill, are placed in a relatively loose condition. For example, in the course of laboratory investigation known to the writer, a sand initially placed at a relative density* of 25 per cent was increased to a relative density of over 70 per cent under approximately 8,000 load repetitions.

This typical sand, used as embankment or abutment back-fill and placed according to specifications presently used by many state highway departments, could undergo a subsidence of as much as one-inch per foot of fill. The results of traffic densification of improperly placed granular back-fill are illustrated by Figure 1 (b).

Analysis Is Possible

The causes and effects of the conditions illustrated by Figure 1 are well known to soil and foundation engineers. An analysis and prediction of these conditions, before their development, is made possible by the application of principles of modern soil mechanics subsequent to well-engineered subsurface exploration and laboratory testing of representative and relatively undisturbed samples of the foundation soils. The performance of the bridge-abutment-unit under service loadings and conditions, can be anticipated in advance of construction and a procedure prescribed to prevent ultimate distress of the bridge approach pavement.

How To Avoid The Bump

Pavement warping at bridge approaches has been shown to be the result of differential settlement between the bridge abutment and the approach embankment, often the result of consolidation of the foundation soils. There are available to the soil mechanics engineer several methods and techniques to minimize anticipated differential settlements. Each of these methods has its own merit, depending upon the controlling site and design conditions. Only the more widely used procedures will be considered here, along with the optimum conditions of application. It should be pointed out that approach embankment treatments are also applicable to highway embankment design in general.

The first and most widely used method to be considered where potentially detrimental differential settlements are anticipated, is the "embankment rest" procedure. Here the principle is simply to construct the embankment and leave it in place—prior to pavement construction—until most of the consolidation of the foundation soils is complete. This method is a

*100 per cent and 0 per cent Relative Density correspond to the maximum and minimum densities obtainable in the laboratory.

embankment fill and consolidation rates high. Undergo a one-inch loss of traffic placed during construction by

Figure 1 shows foundation analysis and conclusions, based on the use of principles of mechanics and engineering. Laboratory and field samples are performed at different-unit load conditions to advance procedure. A wide range of materials is available for several uses to eliminate differential settlements. The method of sand-drains is widely considered to be the most effective. It could be used in embankments applicable to design in

bridge approaches between the abutment and the end of the bridge. Then the foundation soil is available for several uses to eliminate differential settlements. The method of sand-drains is widely considered to be the most effective. It could be used in embankments applicable to design in

drainage, sand blanket, and surcharged with embankment soils to activate drainage. The effect of the sand drains is to improve drainage of the impervious soils so as to accelerate consolidation of the foundation soils prior to construction. The sand-drain method is most applicable in areas of relatively deep soft foundation soils with little initial supporting value, such as found at marsh or swamp crossings.

Settlement is not the only problem in deep soft subsoils; the stability of the embankment during

Another widely used variation of the pre-consolidation concept is that of sand-drains. Sand-drains are usually 10- to 24-in. diameter vertical columns of permeable sand, placed in relatively soft soils by a mandrel-driven steel shell. The shells are filled with sand and subsequently withdrawn. The drains are joined at the surface by a free-

construction is also of prime importance. The reduction of soil voids and moisture during consolidation of the foundation soils, results in an increase in the strength of the soil, and correspondingly in its ability to support embankment loads. To maintain embankment stability during construction, the rate of filling must then be controlled by the rate of consolidation. Furthermore, if the embankment is to be safely and economically raised on deep soft subsoils, consolidation, and the accompanying increase in the supporting value of these soils, must be accelerated. Under these conditions, the sand-drain method may be the only solution.

When to Excavate

To eliminate the differential settlement or stability problem where the offending soils are relatively shallow, the obvious solution is to remove them. Economically, excavation is generally limited to conditions where the compressible soils

Differential settlement of the bridge abutment unit has been compensated for in the design of the superstructure. Often the approach pavement is cantilevered to the bridge deck. This construction only acts to transfer the location of the bump if the foundation soils beneath the approach embankment are the source of settlement. The cantilevered approach slab does, however, tend to bridge the area of subsidence caused by densification of abutment backfill. A much less common method of planned differential settlement compensation is obtained by providing adjustable jacks beneath bridge bearings at the abutment and piers. This procedure is only applicable if large differential settlements are anticipated that cannot be minimized in the time available before construction.

Embankment Compaction

To design against settlement of embankment soils, the embankment must be placed in such a manner as to minimize consolidation effects. A discussion of the solution to this problem involves another concept of soil mechanics—the moisture-density (compaction) relationship of soils. A decrease in soil voids and an increase in grain contact can be accomplished by preconsolidating embankment soils during placement by the process of mechanical compaction.

If the soils are too wet and not free-draining, water will not escape rapidly enough under the transitory compactive stresses to allow densification. Imposed stresses will be partially taken by water in the soil voids (pore water), and a reduction of soil voids will not be easily achieved. If the soil is too dry, densification is difficult because high capillary stresses resist particle adjustment. This is especially true in soils with an appreciable amount of fines. Field and laboratory tests have established that between these limits there is an optimum condition—the "optimum moisture content"—at which compaction is most efficient. Laboratory compaction tests on representative soil samples are used to define the peak density (the minimum soil voids) and the optimum moisture for a given compactive effort. The moisture-density relationship of a typical embankment soil using the Standard AASHO compactive effort is shown as Figure 2. Laboratory test results in terms of the peak laboratory density are used as a

(Continued on page 178)

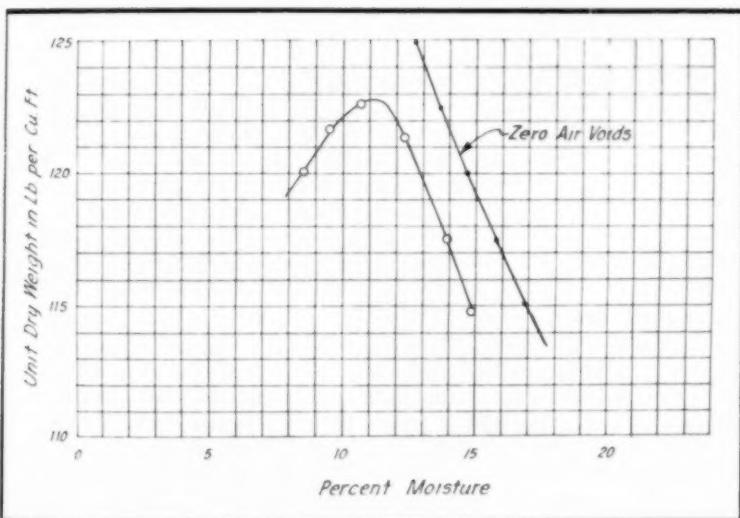


FIGURE 2. Moisture-density relationship of soil compaction as determined by AASHO test method. Material is coarse to fine sand, some fine gravel, trace silt.

draining sand blanket, and surcharged with embankment soils to activate drainage. The effect of the sand drains is to improve drainage of the impervious soils so as to accelerate consolidation of the foundation soils prior to construction. The sand-drain method is most applicable in areas of relatively deep soft foundation soils with little initial supporting value, such as found at marsh or swamp crossings.

Settlement is not the only problem in deep soft subsoils; the stability of the embankment during

do not exceed five to six feet in depth, or—under the most favorable conditions—a maximum of ten to twelve feet. Partial excavation of compressible soils to minimize the anticipated settlements has also been used with varying success. Often the maximum depth of excavation is adjacent to the bridge abutment, with the excavation depth gradually decreased away from the abutment. Feathering out the excavation for an appreciable distance from the abutment may smooth out differential settlements, but it will not entirely eliminate them.

A STUDY OF THE USE OF HOME FOOD WASTE DISPOSERS

BECAUSE OF THE CURRENT INTEREST in food waste disposers and the side effects, beneficial and objectionable, in respect to them, the Editors of PUBLIC WORKS sent questionnaires to all state health departments and to 1,271 cities having a population of 10,000 or more. To the time of preparation of this article, 530 returns had been received by cities, or about 41.7 percent; and 40 from the states, or 80 percent.

Matters of special interest were to determine: (1) whether or not such disposers are permitted; (2) what percentage of homes are equipped with them; (3) if there has been any significant reduction in the volume of refuse collected; (4) if there has been any saving in collection costs; (5) if there has been any clogging or stranding of solids in the sewers which were traceable to ground garbage solids; and (6) if the use of such disposers has increased noticeably the load on the sewage treatment plant.

A table has been prepared summarizing the data by states. Comments by engineers and others are also presented, as is a summary of state reaction. The tabular matter needs a certain degree of interpretation to make it fully valuable.

VERY FEW cities bar use of disposers—only 23 of the 527 replying—in areas where public sewers are available. A considerable number feel strongly that septic tanks and/or cesspools are unlikely to be able to handle the increased load and advise against or prohibit their use under such conditions.

The tabulation of percentage of homes served shows that only 63 of 430 reporting have more than 25% of homes equipped with disposers. A good guess of overall use indicated would be 8 or 9% which still seems high; and the possibility is that there was some estimating done.

Less than one out of five cities reported any significant reduction in volume of refuse collected. In a way, this result had to be expected because with only 5 or 10% of the homes scattered through a city so equipped, a noticeable reduction in volume of waste could not reasonably be anticipated. In new sections, where nearly all houses have disposers, the situation could well be different.

The few negative replies to the question on savings in collection

costs could be misleading. Actually, the 309 cities which reported no reduction in volume should be added to the 71 cities reporting adversely. This leaves very few replies indicating that reduction in collection costs is a factor. Some specific cases are reported in the comments.

A variety of replies was received on the clogging question. These indicate that this is not a problem in residential areas except on very flat grades; or with combined sewers; and possibly at upper ends of laterals having small flows. A considerable number of difficulties with supermarkets and other commercial installations were reported and this appears to be a problem that needs study. Volume of flow, size of sewer and grease content appear important. The latter cause was mentioned many times by repliers.

Perhaps the most misleading item in the tabulation is that which indicates that 275 cities out of 341 noted no increased load on the sewage treatment plant. While the actual figures are correct, it must be realized that no appreciably increased loading will occur when less than

20% of the homes have disposers. A check was made, however, on most of the 25 cities reporting more than 50% of the homes having disposers. With few exceptions, it was found that these cities (a) had no treatment plant; (b) discharged into large nearby metropolitan system or authority lines; or (c) had primary treatment only. The data therefore must be examined further to yield evidence of real value.

In the comments which follow, the names of commentators have been omitted. No space was available on the questionnaire for typing in the name of the person supplying the data. Unfortunately a considerable number of the signatures could not be deciphered with certainty and it was decided to omit all names.

Comments by Cities

ARIZONA

Mesa: Home grinders do not decrease garbage load as wrapping cans and bottles must be removed; about 15% of homes have disposers.
Phoenix: Refuse volume reduction "not noticeable; clogging problem very minor."

CALIFORNIA

Alhambra: 20% of homes served; no reduction in volume of refuse; no savings on collection costs; no treatment plant; use of disposal units "helps keep house connections clear."

Costa Mesa: 50% of homes served; 90% of homes with grinders are less than 6 years old. The amount of garbage collected has decreased each year while the population has increased from 16,000 to 38,000. Sewage treated by Orange County Sanitation District.

Huntington Park: Some problem of clogging and/or stranding at manhole junctions.

La Habra: 75% of homes have grinders. There has been an estimated \$20,000 saving in refuse collection costs.

National City: 65% of homes have grinders. Contractor states that volume of garbage collected continues to decrease as more units are installed. Sewage disposal is to San Diego system and according to that city's engineers, plant loading has increased.

Eggshell trouble is reported by Buena Park, Burbank, Glendale, Los Angeles and Manhattan Beach.

Oceanside: 60% of homes have

grinders. No reduction in volume of refuse collected; no clogging problems; sewage treatment plant has ample capacity.

Palo Alto: "We encourage garbage grinder installations." From 25 to 30% of homes now have them. No problems; no reduction in volume.

Pasadena: There are 2,340 disposal units in use. There has been a reduction in garbage volume collected. Grinders are not permitted in produce markets to dispose of waste fruit and vegetable matter.

Redwood City: 10% of homes have grinders. Requirement that 30-mesh

screen be used seems to have eliminated clogging troubles.

San Mateo: The city has no septic tanks or cesspools; 75% of homes have grinders. A change in character of refuse is considered due more to marketing changes.

Santa Ana: 40% of homes have food disposers. Estimated reduction in garbage volume is 40%. There have been problems in clogging and stranding in sewers and the loading on the sewage treatment plant has increased.

Santa Monica: 70% of homes are equipped and disposers are required

Number of Replies	PERCENT OF HOMES SERVED					Reduction in Refuse Volume		Reduction in Collection Cost		Clogging Sewers		Increased Sewage Load	
	0-5	6-25	26-50	51-75	>75	Yes	No	Yes	No	Yes	No	Yes	No
Alabama	3	1	2	--	--	--	3	--	1	--	3	--	2
Alaska	1	--	1	--	--	--	1	--	--	--	--	--	--
Arizona	2	--	1	--	--	--	2	--	--	--	1	--	--
Arkansas	2	1	1	--	--	--	2	--	--	--	1	--	2
California	76	7	24	19	12	7	15	42	7	15	20	40	12 36
Colorado	7	1	1	4	--	--	3	3	1	1	1	5	3 4
Connecticut	14	7	4	--	--	--	3	5	--	4	1	9	-- 4
Florida	11	6	4	--	--	--	8	--	--	--	1	8	-- 9
Georgia	10	8	1	--	--	--	1	7	--	2	--	6	1 6
Hawaii	1	--	--	--	--	--	1	--	--	1	--	--	--
Idaho	5	--	4	--	--	--	1	3	--	1	1	3	-- 4
Illinois	27	11	10	3	--	--	2	18	--	1	2	17	2 12
Indiana	18	6	8	--	--	--	3	9	1	4	1	13	-- 11
Iowa	9	4	4	--	--	--	5	--	1	--	1	6	1 5
Kansas	13	3	4	2	--	--	2	8	1	1	3	10	4 5
Kentucky	2	1	1	--	--	--	1	--	--	--	--	--	--
Louisiana	2	2	--	--	--	--	--	--	--	2	--	--	1
Maine	2	1	1	--	--	--	--	--	--	--	1	--	--
Maryland	4	--	3	--	--	--	1	3	--	1	--	2	-- 4
Massachusetts	27	11	8	1	--	--	1	17	1	3	6	19	1 15
Michigan	18	2	9	3	1	1	5	8	3	3	2	13	3 7
Minnesota	9	1	6	1	--	--	1	4	--	2	2	5	4 1
Mississippi	2	2	--	--	--	--	1	1	--	1	--	1	--
Missouri	11	3	3	2	1	--	2	4	--	1	4	5	4 3
Montana	5	2	2	--	--	--	--	4	--	2	1	--	3
Nebraska	5	2	2	--	--	--	3	--	--	1	4	1	2
New Hampshire	3	--	--	--	--	--	1	2	--	--	1	--	2
New Jersey	32	15	2	--	--	--	1	14	--	2	2	12	3 7
New Mexico	5	1	1	3	--	--	1	4	--	1	3	2	2 3
New York	27	17	8	--	--	--	2	20	--	3	2	23	2 17
North Carolina	15	11	2	1	--	--	--	12	--	--	--	11	-- 13
North Dakota	2	--	2	--	--	--	1	--	1	--	1	--	--
Ohio	29	14	8	1	2	--	7	13	1	5	7	17	6 19
Oklahoma	11	7	3	--	--	--	1	9	--	5	2	9	1 9
Oregon	7	4	2	--	--	--	1	3	--	1	1	5	2 5
Pennsylvania	26	11	3	--	--	--	2	13	--	2	2	16	1 14
Rhode Island	7	4	2	--	--	--	4	--	1	--	5	--	4
South Carolina	3	--	2	--	--	--	2	--	1	--	2	--	1
South Dakota	4	1	3	--	--	--	1	3	--	1	2	3	2 1
Tennessee	2	2	--	--	--	--	2	--	--	--	1	--	2
Texas	28	15	12	--	--	--	--	24	--	4	2	20	5 22
Utah	2	1	--	1	--	--	1	1	--	--	2	--	1
Vermont	3	1	1	--	--	--	2	--	--	2	1	--	1
Virginia	7	5	2	--	--	--	--	6	--	1	--	6	-- 5
Washington	11	1	9	--	--	--	1	7	--	2	1	9	-- 6
West Virginia	3	1	2	--	--	--	--	2	--	--	2	--	1
Wisconsin	13	5	6	1	--	--	2	10	1	1	9	2	-- 11
Wyoming	1	--	--	1	--	--	1	--	--	--	1	--	--

Cities NOT Permitting Installations

Connecticut 1; Florida 1; Massachusetts 2; New Jersey 13; New York 2; Pennsylvania 3; South Carolina 1.

● TABLE SUMMARIZES replies from cities on use of home disposers and on effect on garbage and sewage treatment procedures.

Municipal Officials Comment on Use of Home Food Waste Disposers . . .

by ordinance. No significant reduction in refuse volume and no problems.

COLORADO

Aurora: Over half the homes are equipped. "We get more gas from the greater solids content of the sewage; but the sewage is more prone to odors."

CONNECTICUT

New Haven: 5 to 10% of homes are equipped; sewers are combined. "So far here in New Haven we have not experienced any perceptible difficulties due to garbage grinders. Speaking from personal experience at our home, we grind up practically all the garbage except bones and other hard substances leaving very little to collect."

"In one of our plants which treats house sewage, emanating from the better sections of the city, so far we have not discovered any ill effects of ground up garbage in the sewage. However, in a separate system it is my personal opinion that an excess of ground up garbage might give trouble in clogging the sewers, although our sewage ordinance specifically defines what properly shredded garbage is, namely no particle greater than one-half inch in diameter thus assuring a free flow in the sewer."

Willimantic: 5% of homes equipped. "We believe the increased production of gas in our digesters due to garbage grinders is worth whatever small detrimental effects they may have."

"Our one development that is 100% grinders shows the best cleanliness of sewers which we attribute largely to the extra water flushing used; our sewage treatment plant was designed with garbage grinders in mind since we believe the city should provide sewers for the present day improvements and advantages rather than to discourage them."

FLORIDA

Jacksonville: Home grinders are not permitted due to flat grades of existing sewers.

Lakeland: Being in a citrus processing area, we handle industrial citrus solids in our disposal system, hence maintain a system that would

ordinarily accommodate about 60,000 people. Garbage grinders are negligible in our operation.

St. Petersburg: 10% of the homes are equipped. There are problems in clogging or stranding where grinders are used in commercial establishments; where garbage grinders discharge to lift stations, troubles occur.

HAWAII

Honolulu: Egg shells and grease tend to cake interior of sewers.

ILLINOIS

Centralia: encourages use and is considering requiring grinders in new construction.

Chicago: Studies made by consultants and published recently state that, in Chicago, a survey of one night club, 12 restaurants, four hotels, two food processors, a men's club and four supermarkets showed that these establishments were responsible for 28,300 pounds of waste into the sewers daily. Grease is reported as a problem.

Mt. Vernon reports some problems of clogging or stranding of solids at supermarkets using grinders.

INDIANA

Columbus: is considering a non-compulsory educational campaign to encourage property owners to install sink disposals or grinders. This would increase the overall load to the sewage disposal plant which must be enlarged.

At Connersville all garbage is processed at the sewage treatment plant.

West Lafayette: In the newer areas, sewers have been designed in anticipation of installation of grinders. In older parts of town, sewers may not be adequate. The city engineer is not in favor of such installations but no regulations have been made to control them.

IOWA

In Ames, where 20 to 25% of the homes have grinders, effect has been very minor but load has no doubt increased on treatment plant.

Clinton considers grinders to be a "sort of soup and fish proposition and anyone who can afford to install and operate one is welcome to it.

People have extra babies and we don't get steamed up over it."

KANSAS

Garden City: reports some clogging of sewers from grinders at supermarkets.

Kansas City: "Rats thrive on ground garbage in sewers."

Wichita: In providing additional capacity at the primary sewage treatment plant, consideration was given to the estimated volume resulting from grinders but this was not a principal reason for the increased capacity. It is estimated that 30% of the homes have disposers. There has been some trouble with sewers, mostly from industrial users.

MASSACHUSETTS

Brookline: has recently appointed a committee to study the question of making disposal installation mandatory. At present about 30% of the homes are equipped; volume of refuse collected has been reduced 20% and collection costs 10%. Sewage is discharged to the Metropolitan Sewerage System.

Leominster reports that homes with disposers request refuse collections at least once a week.

Pittsfield reports clogging or stranding troubles with a supermarket but the problem has been corrected.

Home grinders are not recommended in most areas of Shrewsbury.

Waltham does not now permit grinders but will after a relief sewer is completed.

MICHIGAN

Grosse Pointe Woods where 95% of the homes have disposers, has no garbage collection at public expense. Sewers are rodded and flushed annually. Sewage is discharged to the Detroit system.

In Highland Park all commercial buildings have grinders.

Garbage grinders or home incinerators are mandatory in Inkster.

MINNESOTA

Minneapolis has had a commercial grinder license and City Engineer regulation since 1953. Such grinders can be denied where sewers do not have sufficient flow. A fee of \$25 is charged for the investigation.

"We have had increased maintenance in areas of hotels and large restaurants where commercial grinders are used. Apartment houses being constructed now are usually equipped with the domestic size grinders for each apartment. 65 to

70% of increased strength sewage is due to suburban use of grinders in areas of new homes with grinders.

"In this department's report to the City Council in 1953 we suggested an annual fee or charge for commercial grinders based on horsepower and an annual fee of \$1 for residential grinders. For hotels and large restaurants we suggested \$200 annual charge. This did not materialize, we have only the \$25 initial fee for commercial grinders and only the plumbing inspector's permit charge for domestic."

MISSOURI

Fulton reports that the grinder at the State Hospital definitely adds to the solids load.

Supermarkets using grinders have caused some clogging and/or stranding at Moberly.

NEBRASKA

Omaha, which has 25% of the homes with grinders, reports: "Increased sewage volume is primarily due to growth of the city. The garbage grinder has helped reduce the amount of putrescible wastes as garbage, but the changes in merchandising and packaging have had a greater effect on refuse volume."

NEW JERSEY

Bloomfield does not prohibit but does not encourage.

East Orange reports troubles with grinders at restaurants and supermarkets rather than at residences and it was for this reason such units have been barred.

Haddonfield reports grinders are a nuisance in sewage treatment unless the plant is designed to accommodate them. The heavy load of grease interferes with treatment.

Madison reports grinders are not permitted because of overload on sewage treatment plant.

Passaic states that garbage grinders would probably not interfere seriously with sewage flow but the sewage flow is metered and \$40 per mg is paid to a sewerage authority for disposal. On this basis it is computed that the additional flow from one supermarket would cost the city about \$30 per year.

NEW MEXICO

Carlsbad: Grinders increase the load in digesters but future addition to capacity will be due primarily to increase in population. At present 30% of the homes have grinders.

Clovis: "We see trouble in sewer lines from new additions having these units. The build-up of grease is very great in places. We still have

our problems with other solid wastes."

Around restaurants in Las Cruces, there is a troublesome build-up of grease.

NEW YORK

New York City: Most of the sewers are combined. On a yearly average only about 3 percent of the sanitary flow escapes to the harbor; but during periods of intense rainfall 90 percent or better may reach the harbor. The city will have expended \$500 million for intercepting sewers and sewage treatment plants by the time the pollution control program is completed. It does not seem sensible to permit the escape of ground garbage in addition to the sanitary flow during time of storm. Furthermore an additional expenditure of \$150 million is contemplated to safeguard bathing beaches now in existence and develop new ones. This is another reason for not permitting the discharge of ground garbage to the sewers. Still another is the flat gradients existing in much of the system which promote stranding of solids and consequent decomposition and cleaning problems. Aeration tanks and other units would require a probable increase of 50 percent in capacity, which would incur a heavy additional capital expense. The Department of Sanitation advises that saving in collection expense, if garbage grinding were adopted, would be trivial. For all these, and for other reasons, the City of New York prohibits shredding or grinding of garbage for discharge into the sewerage system (Communication from F. H. Zurmuhlen, Commissioner of Public Works).

Lack of digester capacity at Middletown is basic reason for not permitting installation.

Rockville Center would like to make installation compulsory but state law lacks provision.

Objections to use of grinders at Rye include pump capacity and settling out of hard particles in older sewers.

NORTH CAROLINA

Wilson restricts installation along small sewer lines and is watching use; when necessary will restrict.

Lumberton has no treatment plant. So far 5% of the homes have grinders. If the number increases, city anticipates that restrictions will be necessary.

OHIO

Columbus reports considerable trouble from grease.

Kettering, with 75% of the homes

equipped with grinders has a noticeable increase on the loading of the sewage treatment plant.

South Euclid reports a build-up of grease in lines serving homes having grinders.

OREGON

Klamath Falls, with 5% of the homes equipped with grinders, has observed negligible effects. However, the city operates a plant serving Kingsley Air Force Base and housing project. There are 290 units, all equipped with grinders. This has put an overload on the plant there. Sewage arrives in a septic condition and is very difficult to treat.

PENNSYLVANIA

Chester has combined sewers which are in poor condition and does not permit home grinders because of settling of organic matter in the lines.

In Lewiston, grinders are permitted but may be ordered removed if particle size causes problems.

RHODE ISLAND

Newport: Due to the small percentage of homes having grinders (3%) there has been no appreciable buildup in the lines except in one case where a hospital is located at the end of a sewer line with a small amount of flow. Regular flushing takes care of the problem.

TEXAS

Fort Worth, which now has about 17% of the homes served by disposal units, has a very strong sewage due to packinghouse wastes. Increased dilution, due to the growth of the city, has resulted in a decrease in the strength of the sewage, so that any effect of home garbage grinding is not noticeable.

Houston reports that about 60% of the homes built over the past 3 or 4 years are equipped with grinders; but only 20% of the homes that are 4 years or more old.

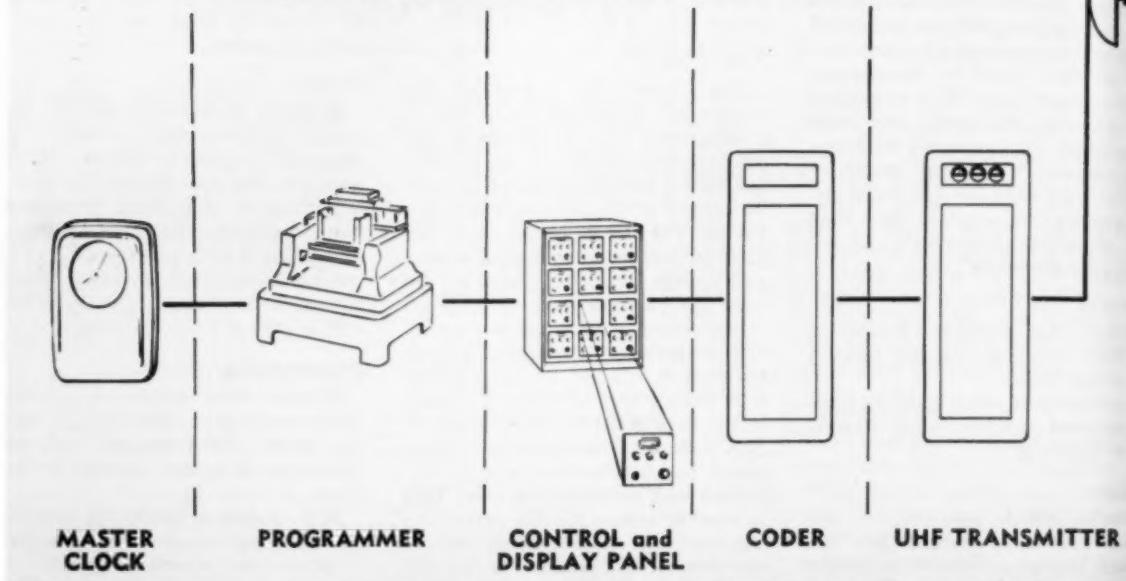
Midland reports no noticeable difference in collection costs, with 10% of the homes having grinders, but a greater ease in handling the waste has been noted.

WISCONSIN

Sewers with flat grades have caused some clogging problems in Appleton, Eau Claire, Waukesha and Wausau.

Comments and quotations giving the reactions of State Health Departments to the use of home food waste disposers begin on page 163.

Central Control Station



WASHINGTON USES RADIO TO

FRANCIS E. TWISS

**Deputy Director for Traffic,
Engineering and Operations,
Department of Highways,
Washington, D. C.**

MORE CARS mean crowded streets. The resulting traffic congestion means more accidents, more lost time and more worries for civic officials and motorists. To solve this problem, cities must build new streets but must also increase the traffic capacities of streets already in existence.

In this municipal search for ways to accommodate more traffic on existing streets, a basic tool is the interconnection of traffic signals. By varying and synchronizing offsets and dials at each intersection or group-of-fit situations and times, traffic volume capacities can be increased materially.

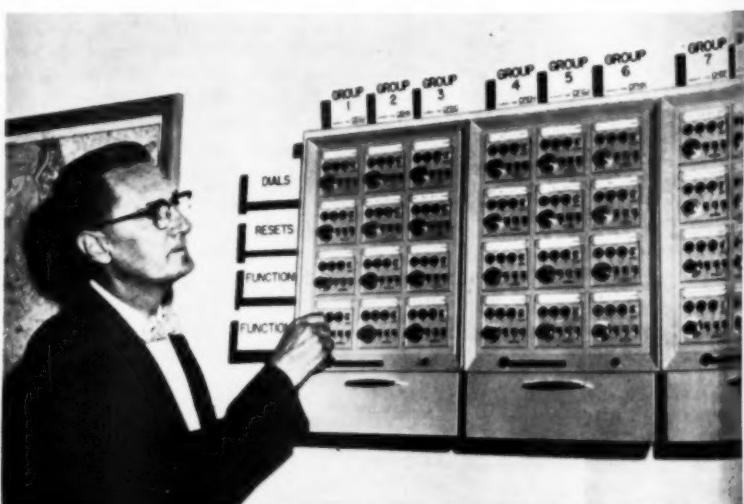
In Washington, D. C., 600 of the city's 1,000 signal-controlled intersections are located in the downtown district and connected by underground cable. Several other outlying intersections have been cable-connected into small isolated groups. To extend interconnection and to increase coordination and synchron-

ization over the entire system, the city has turned to radio control. An ultra-high frequency network, built by Motorola, ties the signal-controllers at over 800 intersections to a master control station.

Since the first phase of the Washington system has been in operation, traffic studies have shown that

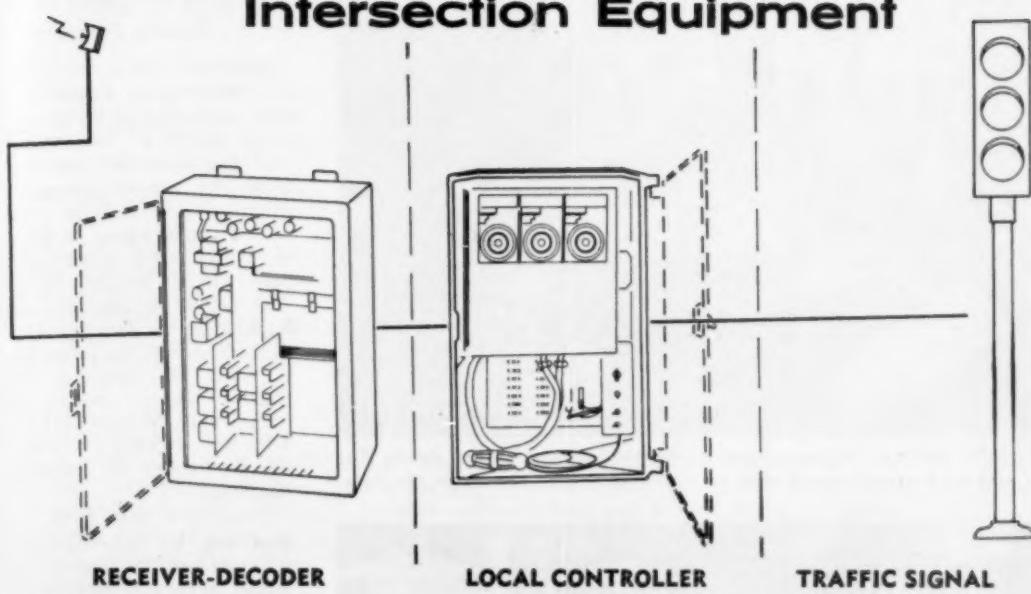
travel time on radio synchronized and controlled stretches of two major streets had decreased as much as 20 percent during rush hours. Meanwhile, speed increased as much as 25 percent and volume was up 15 percent.

The same effect would have been noted if the interconnection had been



● THE AUTHOR at the control panel which shows programs in effect at each group of intersections and also permit overriding the pre-programmed signals.

Intersection Equipment



INCREASE STREET CAPACITY

accomplished by cable. However, radio control provides great flexibility and installation costs are much lower than for underground wires, which require costly construction.

System Operation

In the Washington system, receiver-decoders at intersections get synchronization and function signals from a central station. Consequently, all traffic signals operate in precise synchronization in the specific programs ordered by the master station.

Washington's initial installation included 87 intersection units and the central station equipment. The 600-intersection downtown bloc of cable-connected signals is radio-controlled as a unit in this system. Early this year, 75 street units were installed, bringing 93 more intersections into the network; and 66 intersection units were added later. These units include both additional receiver-decoders for isolated inter-



● FIELD inspection of system. Intersection units, like the one shown here, receive and decode tone signals from the central station.



● INTENSIVE traffic surveys and studies provide the basis for function signals. The complex program for each signal must be converted to perforations on the tape.



● TAPE IS run through master programmer; lights tell what program has been sent.

sections and decoders to install at cable-connected intersections to refine control within the already joined blocs.

The fully transistorized intersection units, mounted on a pole or pedestal near the signal control boxes, receive and decode tone signals from the central station. Appropriate offset synchronization, dial and other function change signals are fed to the controllers to coordinate traffic flow.

Synchronization and coding apparatus, a punched tape programmer and a control display panel are the main components of the master station. A 960-megacycle, 50-watt transmitter is at a remote antenna tower connected by wires to the master station. Its location provides

coverage throughout the metropolitan area.

The central station sets up two types of signals to be transmitted to the various intersections. Tones which synchronize all controller dials in the system are sent continuously. Other signals which change traffic programs are sent when needed. A specific tone signal is generated for each of the seventeen master time cycle dials in the synchronization apparatus. The units are set at standard five-second intervals from 40 to 120 seconds to provide benchmarks for all intersection controller dials. When the interupter key on the master synchronization dial reaches time zero, it momentarily stops its tone signal transmission. This absence of tone

is the synchronizing period for the appropriate local controller dials.

Traffic Programs

Intensive traffic surveys, which aid Washington engineers in the close prediction of traffic volume on major streets at various times, provide the basis for function signals from the master programmer. A complex program for each connected traffic signal in the city has been converted to perforations on paper tape. During the morning rush hours, for example, offsets are established to aid inbound traffic. In the evening, the offset is changed to favor the outgoing rush hour traffic. Other special programs switch dials in intersection controllers to provide different cycle lengths, splits or various on-off functions.

Tapes are stored on cartridges that can be interchanged on the programmer. To provide more flexibility, several programs can be put on the same tape so that a flick of the switch can change a normal weather traffic program to one for bad weather. Tapes can also be easily modified to suit changing traffic conditions as determined by continuing surveys.

Each complete program instruction utilizes three frames of tape. The first frame includes complete time and program type information. The second provides program information for the indicator and control console. The last frame includes address and function information for the tones to be transmitted to the receiver-decoder units. To assist in preparing tapes, Motorola has designed a form with spaces corresponding to the 80 perforations possible in each frame of tape.

The coding apparatus converts the tape perforations and synchronization dial movements to tone signals to be sent over the air. A total of 53 precision-built oscillators generate tones at the request of the programmer and synchronization equipment.

The programmer has the capacity to reach any one of 1000 individual intersections or groups of intersections. It can select any one of 18 functions to be performed at these addresses. On the control and display panel, the program in effect at each group of intersections is displayed. The panel also contains manual control buttons which can be used to initiate traffic programs or override pre-programmed signals in case of emergencies or the need for a special program at any intersection.

2-IN-1 WATER TANK FACILITATES MAINTENANCE

W. E. CHAPMAN

City Engineer,

Daly City, California

WHERE CAN you find a pre-stressed concrete water reservoir with an additional tank inside? In Daly City, California. Why is it there? To allow cleaning without taking the reservoir completely off the line.

Several methods by which this purpose could be accomplished were considered by engineers during design. One such possibility was to provide a vertical wall across the diameter of the tank, dividing it into two equal sections. This idea was abandoned after a cursory check revealed severe bending stresses that would be caused in a prestressed tank when filled on one

side and empty on the other. It became clear that the usual advantageous radial stresses or "hoop tensions" present in a normal pre-stressed tank were lost by this method. Furthermore, the dividing wall itself would be difficult to seal since a prestressed circular wall moves in and out in a radial direction as the tank is filled and emptied.

Another method which was subsequently dropped was the possibility of building a two-story tank. Either tank could then be left in operation or cleaned as desired by the operator. Obvious cost factors eliminated this alternative.

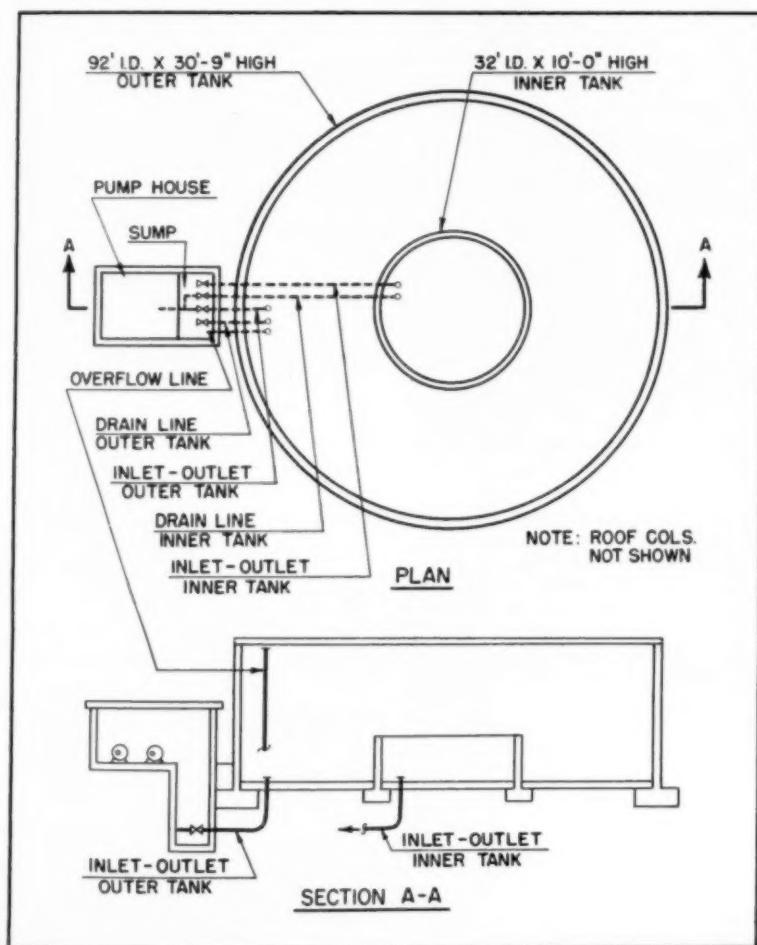
Still another way, and one which is commonly practiced in this vicinity, would be to build two separate and equally sized tanks side-by-side. However, this alternate increased the amount of land necessary for the tank site and it further increased the cost since one large tank would be cheaper than two tanks having the same combined capacities.

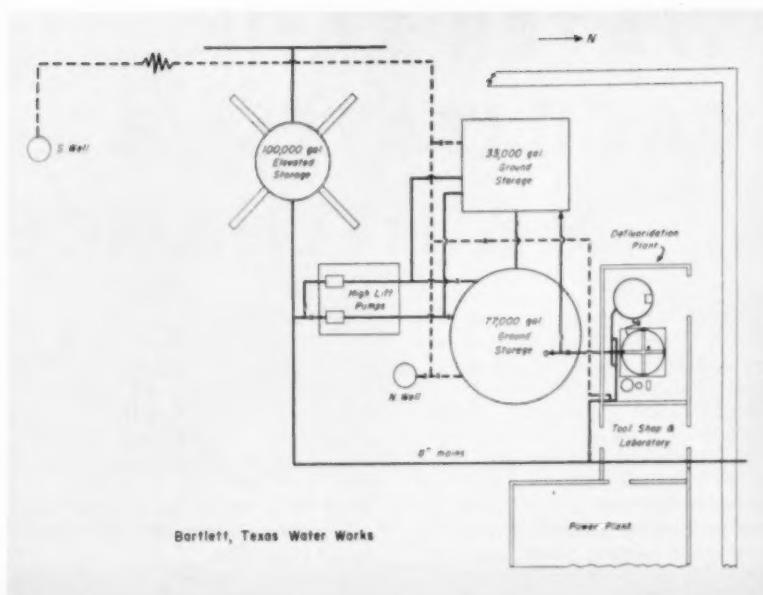
The final solution to this problem was to provide a smaller reinforced tank within the tank itself. This has the advantage of concealment, avoidance of a separate roof and required no additional land on the site which was already crowded. The capacity of the main tank is 1,500,000 gallons, while the smaller interior tank holds 50,000 gallons. The interior tank was structurally designed to take loads from either side. The two tanks are valved in such a manner that under normal operations, both would have identical water levels. For cleaning operations, valves are located to allow the main tank to be cleaned while the smaller interior tank remained in operation. The same was true when the smaller tank was cleaned, leaving the remaining portion of the larger tank in operation. Naturally, during the cleaning operations, neither tank can be filled higher than the height of the interior tank.

Layout and specifications for the tank were drawn up by Otis T. Callhoun, a former City Engineer of Daly City, and the author. Structural design and supervision of construction were by the author. The contractor for the project was the E. M. Penn Construction Company of Baldwin Park, California. Construction was completed this year.

Final cost for the entire structure was \$99,700; cost of the interior tank alone is estimated at \$3,500. This may be compared with an estimated cost of \$137,000 for two individual tanks having the same combined capacity as the ones which were installed.

• TWO-IN-ONE design permits maintenance without interrupting service.





● LAYOUT of Bartlett, Tex., water plant, with activated alumina contact unit for reducing fluorides to a safe level. Solid lines show treated water.

as moderate or severe). Despite the widespread use of such waters as sources of public supplies only three plants designed specifically for fluoride removal are now operating. Two of these were designed and built, and are now being operated, by the U. S. Public Health Service while the third is operated by the U. S. Army.

Defluoridation Methods

At present three defluoridation methods have proven practicable under varying conditions of raw water quality and availability of treatment chemicals. Two of these methods involve the use of either activated alumina or bone char in

PARTIAL DEFUORIDATION OF WATER

F. J. MAIER

Sanitary Engineer,
Division of Dental Public Health,
U. S. Public Health Service

FOR MORE than 10 years public water supplies containing excessive fluorides have been treated in order to reduce the fluoride level to the optimum (0.6 to 1.5 mg/L fluoride depending on the local temperature). Early in 1960 the teeth of the children living in communities served by such treated supplies were re-examined. It was found that the widespread fluorosis had been stopped among children brought up on defluoridated water and no single instance of severe fluorosis was observed.

The undesirable disfigurement and increased cost of dental care associated with fluorosis was known for several decades prior to 1931 when the cause was discovered. Soon afterward, it was shown that the severity of fluorosis was directly related to the fluoride concentration in the water used during the period of permanent tooth calcification. Children continuously exposed to water containing about 5 mg/L or more fluorides are invariably afflicted with mottled enamel

of the permanent teeth; many of these children have gross calcification defects which weaken the enamel and cause eventual loss of the teeth through attrition.

Even though methods for the removal of excessive fluorides from water were published soon after the cause of fluorosis was discovered, little, if any, progress was made in the reduction of the incidence of fluorosis through these methods. This lack of acceptance of available measures for preventing fluorosis is probably due to the alleged excessive costs of treatment plants, the costs of operating such plants, and the complexity of the operating procedures. Actually the experience we have so far gained in the design, construction and operation of various processes for defluoridating water indicates that these allegations are no longer tenable.

At the present time there are approximately 4.1 million people living in 1,200 communities which are served by water sources containing fluorides in excess of the optimum range. In 264 of these communities (in which 690,000 people live) the fluoride levels are at least three times the optimum (a level at which about 10 percent of children exhibit fluorosis which has been classified

the form of an insoluble granular media which removes the fluorides as the water percolates through them. The media are periodically regenerated by chemical treatment when they become saturated with the fluoride that was removed from the water. In the third method magnesium may be added to the water in the form of dolomitic lime. It is removed, after absorbing the fluorides, by passing the water through settling basins and filters and is then discarded.

Activated alumina is used at the plant at Bartlett, Texas, and at the Army plant at Camp Irwin, near Barstow, California. It is also used in several experimental home defluoridation units. This media is available from several aluminum manufacturers in various mesh sizes of granules and degrees of purity. Activated alumina is commonly used as a desiccant, particularly in air conditioning equipment. For our purpose, it is used in mesh sizes between 28 and 48. It is currently selling for 7½ cents per pound (FOB manufacturer) and weighs, in place, 50 pounds per cubic foot. The Bartlett plant contains 500 cubic feet of media in a standard, circular, steel, filter tank 11 feet in diameter and 11½ feet high. It is fitted with a

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steel pipe-grid underdrain, steel wash water troughs and a 4-inch plastic acid and caustic distributor. There is a 12-inch layer of graded gravel underlying 60 inches of media. The regeneration equipment includes a 6,000 gallon caustic solution tank with electric mixer and pump and a system for measuring, diluting and metering acid solutions. The plant is capable of treating 400 gpm of Bartlett well water (Edwards limestone formation) and was designed to reduce the fluoride from 8.0 mg/L to an average of 1.0 mg/L. The variations in some common ions which were analyzed in the treated water from a typical cycle are shown on the graph below.

Either or both of the two 220-gpm well pumps discharge into the contact tank. They are controlled automatically by a float switch in the two interconnected, treated-water, ground-storage tanks. Overflowing of the contact tank is prevented by a float-valve-actuated mercury switch wired into the well pump starters. The float valve also positions the diaphragm-actuated rate-of-flow controller.

When between 400,000 and 500,000 gallons of 8.0 mg/L fluoride water have been treated the media becomes partially saturated with fluorides and must be regenerated. Regeneration of the activated alumina is intended primarily to remove these accumulated fluorides by means of a caustic solution which is subsequently discarded. Regeneration consists of various steps designed to remove, by backwashing, the accumulated solids that had been strained from the water; to remove (by means of a weak caustic solution) the fluorides that had been adsorbed by the media; and to neutralize the residual caustic with weak acid and water rinses.

Before regeneration is started, a caustic solution of approximately 1 percent strength is prepared by dissolving 400 pounds of flake sodium hydroxide in 5,000 gallons of water. Equipment is available for returning the spent caustic for reuse but this has been found to be impracticable because of excessive contamination by other ions. Plans have been completed for changing to liquid (50 percent) caustic which is considerably more economical. The liquid caustic will be stored in the caustic solution tank and fed into the rinse water line with a gear pump.

The acid is applied to the media as a 0.05 N solution. This is obtained by diluting the 66° Baume' sulfuric acid in two steps—to 15

percent and then to 0.05 normal. An aspirator-induced vacuum is used to remove 284 pounds of acid from the shipping drum to a measuring tank. The acid flows into and is mixed with 194 gallons of water in a 252 gallon lead-lined tank. During regeneration this mixture is diluted with 61 times its volume of water. Lately, the 15 percent acid has been fed with a diaphragm-type chemical solution feeder into the raw water to reduce the pH to 7.2 (from a raw water pH of 7.8). This has not only increased cycle lengths and improved the removal capacity of the media but has drastically reduced the amount of acid required during regeneration.

At present, the caustic solution is applied counter-currently which combines in one operation the backwashing step (which conserves the treated water formerly used for this purpose) and the caustic application. The caustic solution is applied at the rate of 235 gpm which, after passing the bed, is discarded. Dilution of this caustic in the sewer to the treatment plant (Hays Process) is sufficient to produce no adverse effect on sewage treatment or on the effluent from the treatment plant. About 28,000 gallons of raw water are then used for removing as much residual caustic as possible before the acid treatment. After refilling the caustic tank with spent rinse water the acid feeder is started and raw water at a reduced pH is used until the alkalinity approaches that of the raw water—requiring about 40,000 gallons. This amount of acid rinse also brings the start-

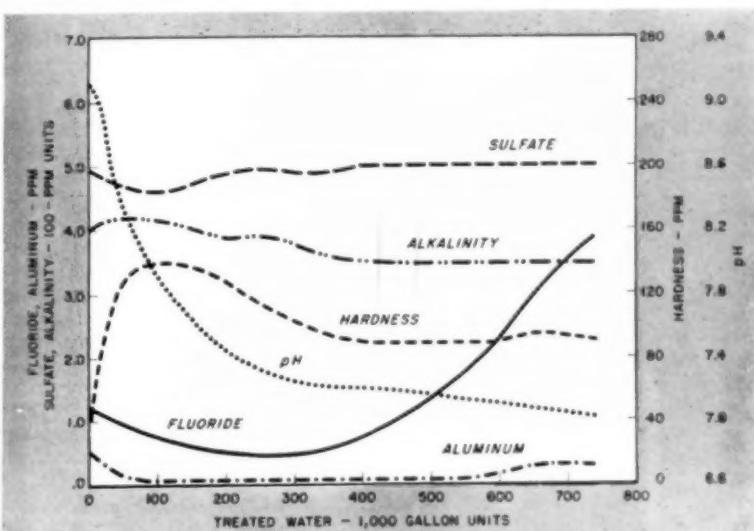
ing fluoride level to 1.0 mg/L. The total amount of water used per regeneration amounts to about 68,500 gallons.

Recently a new well was drilled at Bartlett reaching 2,670 feet to the Trinity sands. This water is similar to the older well water but contains only 3.0 mg/L fluoride. One result of this change was that cycle lengths now extend to an average of 1.5 million pounds. However, because of the greater difficulty in removing fluorides at the lower concentrations, the capacity of the media fell to 400 grains of fluoride per cubic foot of media from the 700-grain level when using the 8.0 mg/L fluoride well. These removal capacities are based on reducing fluorides in the treated water to an equivalent of 1.0 mg/L and pretreating the raw water to reduce the pH to 7.2 with dilute sulfuric acid.

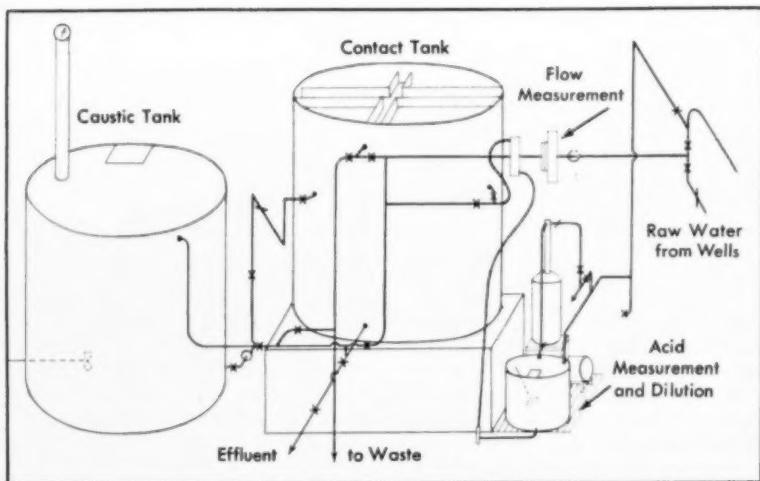
The equipment for the Bartlett plant cost \$11,360 in 1951 including installation. The media cost an additional \$4,000. The building, which includes space for a laboratory bench, connections to the sewer, to the wells and to the ground storage tanks and foundations for the tanks was furnished by the city. Chemical costs for the 3.0 mg/L well were \$25/MG; for the 8.0 mg/L well, \$40/MG, all costs FOB chemical manufacturers. Operation started on March 11, 1952.

Use of Bone Char

The contact tank at Bartlett is open to the atmosphere and the water flows through the media by



● FLUORIDE level varies during treatment cycle at Bartlett, but average is 1 mg/L. A recent change, not reflected in this graph, is to pretreat the raw water to pH 7.2.



● DIAGRAMMATIC layout of defluoridation unit at Bartlett. Contact tank holds activated alumina; regeneration is by caustic rinse and sulfuric acid neutralization.

gravity. The plant at Britton, South Dakota, on the other hand, is a pressure type where the media is confined in a heavy steel tank designed to withstand the pressure of water maintained by elevated storage. The water at Britton is pumped from any of three wells through the contact tank at rates varying between 38 and 206 gpm and thence directly to the distribution system. This tank, equipped with a steel pipe-grid underdrain, cast iron caustic distributor and appropriate piping and valve manifold is 9 feet in diameter with a 10-foot shell height. It contains 300 cubic feet (56½ inches) of media resting on 12 inches of graded level. The media is 28-48 mesh bone char (manufactured primarily for use in sugar refineries for decolorizing sugar syrup) and at present the Britton installation is the only defluoridation plant in the United States using this material.

After treating about 450,000 gallons the media becomes saturated with fluoride and must be regenerated. This consists of backwashing with treated water (370 gpm for about 18 minutes) to remove the accumulated sand and then pumping 5,000 gallons of a 1 percent caustic soda solution through the bed. After the fluorides have been removed from the media by the caustic solution, the excess caustic remaining must be removed. This is done by first rinsing the bed with raw water (7,000 gallons at 150 gpm). After a point is reached where additional rinsing removes very little caustic, the bed is treated with a weak carbon dioxide solution. This solution is prepared by diffusing 84 pounds of carbon diox-

ide gas (from liquefied dry ice) through 8,500 gallons of raw water as it passes (at 150 gpm) a series of diffusers en route to the contact tank. When the pH of the waste water approaches that of the raw water the plant is ready for another cycle. There are 6,500 gallons of treated water used for backwashing together with 28,000 gallons of raw water used for regeneration.

Construction of this plant was completed and operation started November 20, 1948, with a synthetic hydroxyapatite for a media. This material was abandoned during February, 1953, because of excessive (42 percent per year) losses due to attrition. The cost of the equipment for the plant in 1947 was \$12,245 including the media. Bone char of the type suitable for this purpose now sells for 4½ cents per pound, FOB manufacturer. A complete charge of 300 cubic feet costs \$540. Current chemical costs (FOB manufacturer) for regeneration amount to \$53 per million gallons.

Magnesium Process

No plants have yet been built specifically for fluoride removal using the magnesium process. However, there are several softening plants in States with hard-water wells such as Ohio, Indiana and Illinois that incidentally remove small amounts of fluoride along with the removal of magnesium. This combination of functions, using the same equipment and treatment chemicals, would make the cost of defluoridation lower than any other process. On the other hand, the initial cost of building such plants is considerably higher and chemical and sludge handling is more ex-

pensive than for those plants using a chemical-regenerated media.

The magnesium process would probably be primarily used for water requiring softening and a simultaneous removal of fluorides from a level of 2.5 to 3.0 mg/L. A higher fluoride level using this process would probably require an excessive and uneconomical dose of lime. The choice between alumina and bone char cannot, at present, be based solely on a study of the chemical analysis of the untreated water. The decision as to which media or process should be used is now based on laboratory studies of the relative effectiveness and fluoride removal capacity of the two media with samples of the actual water to be treated.

The problems related to the operation, control and maintenance of defluoridation plants are no more difficult than those encountered in conventional water treatment plants. We have found that the employees of water systems previously involved only in well pump operation and meter reading could become capable defluoridation plant operators after adequate training. The equipment required for these defluoridation plants is a collection of standard water treatment plant items and their cost and complexity are identical to softening or ion exchange plants. Many plants have cited operating costs for softening, iron removal, decolorization, clarification or combinations of these processes which are similar to costs of defluoridation.

The removal of excess fluorides from community water supplies to prevent dental disfigurement, loss of teeth and increased cost of dental care is a sound public health procedure. The improved health of those using such water appears to justify defluoridation as much or more than other selected water treatment processes.

• • •

Cost of Painting Traffic Lines

Traffic line striping, according to the 1959 report of the City and County of San Francisco, cost \$83.06 per mile for 535.01 miles; and traffic line spotting cost \$103.35 per mile. Crosswalk lining, including words, cost 13.5 cents per lineal foot; and guidelines were 6.95 cents. School crosswalks, including words were 15.27 cents per lineal foot. Bus zones were 9.42 per lineal foot, including words; and diagonal parking stalls were \$1.1805 per stall while the 4-ft. cross cost 74.37 cents per stall.

HINGED SHEETS of welded wire fabric and "automated" sub-grade sprinkling are the unusual construction features of an 8 mile stretch of four lane divided highway north of Monticello, N. Y., forming part of a relocated, realigned S.R. 17. Merritt-Chapman & Scott Corp., New York, N. Y. holds the \$7,292,000 contract for the 8.3 mile length, including roadway, six overpass structures and guardrail. High P.C.C. paving rates were achieved last summer, averaging over 3000 ft. of 9-in. thick, 12-ft. wide lane per ten hour day, with "best" days of over 4400 ft. being racked up.

Principal advantages of the hinged sheets lie in shipping and handling. The reinforcing ability of the sheet is not affected by the hinge. But because the sheet folds almost in half, the shipping width is reduced from nearly 12 ft. to about 7 ft., permitting delivery on flat bed trucks directly from plant to stock piles on the job sites. From the stockpiles, the hinged sheets are conveyed to pre-determined spots alongside the roadway by truck. Because New York State specifies heavier end sheets in each slab, handlers place two 8-ft. long sheets at slab joints with three 16-ft. sheets in between. Placement of the hinged sheets in the concrete is then readily handled by two workers. The two men lose no time and have no difficulty in placing and unfolding the hinged sheets as soon as the strike-off screed has evened the first course of concrete.

The "automated" sub-grade sprinkling device which the contractor is employing is a perforated pipe extending out across the 12-ft. forms at the leading edge of and at right angles to the first paver in the train. Each time the paver (a Koehring Dual Drum 34-E) moves forward, after having deposited concrete for the first 6½-in. course, the operator opens the sprinkler valve, and a fine 12-ft. wide spray of water evenly wets the entire sub-grade—just ahead of the previously placed concrete. The water is pressure fed from the paver's own water supply. In addition to its sprinkling task, the boom is fixed to the anchor point for the cables by which the strike-off screed is towed.

After depositing several buckets of concrete in front of the screed, which rides the form rails, the paver operator winds the tow cables on a drum, these cables passing through a block on the braced arm just behind, and fastened to the sprinkler pipe. The towed strike-

UNUSUAL PAVING FEATURES SPEED HIGHWAY PROJECT

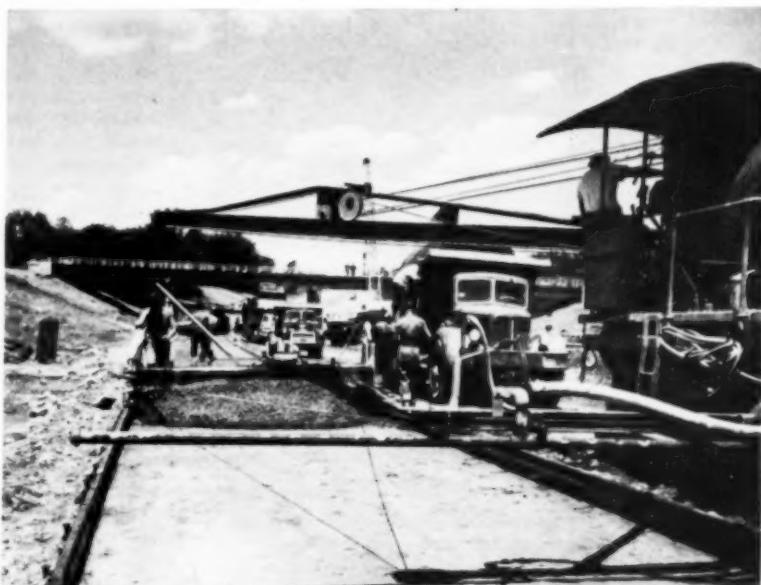
off screed is rigged with concrete vibrators set just inside the form rails to eliminate honeycombing.

Other equipment and operations in the paving train include a Ransome paver for the top course of concrete; a Blaw-Knox paving spreader with tamping vibrator; a

Blaw-Knox transverse finisher, a Jaeger transverse finisher; a Koehring longitudinal finisher; two water wagons; hand finishing tools; two burlap drags; and curing by Sisalkraft paper. A Buckeye (Gar-Wood) precision fine grade machine leads all the equipment.



• **HINGED** welded wire fabric for 12-ft. lane folds to 7-ft. width, reducing the problems of handling and shipping. Picture was taken on NY 17 near Monticello.



• **PAVING** train in operation. Automated subgrade sprinkler operates as the mixer moves forward; the strikeoff screed is pulled forward when the mixer is stationary.

Truck Trends For 61

Few people realize the sheer size of the total public works truck fleet in use today. Of the 55,800 fleets of ten or more trucks in the United States today, a large number are owned by cities, counties or states. Total ownership of trucks and tractor trucks in 1958 by these three jurisdictions was almost 450 thousand.

Public works truck fleets perform essential and often vital work requiring modern, efficient, reliable equipment. Yet the Automobile Manufacturers Association reports that 43.3 percent of all trucks now in service are over eight years old and unfortunately the publicly owned vehicles are oftentimes replaced less frequently than the average.

To bring to the attention of PUBLIC WORKS readers the new trucks being offered by manufacturers for 1961, a brief resume of new models are gathered on these pages. Since not all of the new models have yet been announced, the following data will be supplemented from time to time as further information becomes available.

FORD More than 100 heavy duty, diesel and gasoline powered trucks have been added to the Ford line for 1961. All of the 1961 model trucks feature advancements in appearance, durability, economy, comfort and versatility.

Ford trucks have single headlights to reduce headlamp replacement costs by 50 percent and redesigned hoods and front end sheet metal to permit easier access to engine compartments. Radiator shutters form the grille on extra-heavy trucks, thus eliminating expensive-to-repair decorative grille work.

In addition to their normal warranty in every segment of the commercial vehicle market Ford dealers offer an exclusive 100,000 mile warranty on Super Duty V-8 engines—including full labor costs up to 50,000 miles.

Models offered for the first time include Ford's first entries in the diesel market—the new "H" line of Cummins diesel-powered forward axle tilt-cab highway tractors—and the Econoline series, Falcon Sedan Delivery and P-100



Ford F-100 Styleside Pickup



Ford Econoline Pickup

parcel delivery vehicles for the light duty market.

Ford also will have a wide selection in the economy pickup field with three completely different models—the conventional F-100 pickup on wheelbases of 114 and 122 inches, the passenger-car-styled Falcon Ranchero on a 109.5-inch wheelbase and cab-forward Econoline Pickup with a short 90-inch wheelbase.

The new "H" series highway tractors are offered with a choice of five Cummins diesel engines ranging from 180 to 220 hp, or V-8 gasoline engines from 206 to 266 hp. F-100 and F-250 Styleside Pick-up trucks have a new type integral cab and body which eliminates the separation between the cab and the box, offering a smooth, clean appearance and promising greater rigidity and longer life. These new Styleside trucks carry nine cubic feet more cargo than the previous models and feature a tailgate 13 inches wider with a new, non-rattling handle latch which can be operated with one hand.

Light, medium and some heavy conventional truck model cabs are two inches wider, four inches lower and have lower step-in heights at no sacrifice in ground clearance. The dog-leg front post is eliminated, glass area is increased by as much as 28 percent and ventilation is stepped up by as much as 59 percent.



Heavy-Duty Series 70 Chevrolet

CHEVROLET

Refinements in the highly successful chassis design introduced a year ago, further expansion of models, and styling identification changes mark the Chevrolet truck line for 1961.

Included in the 1961 line are three 4-wheel drive models for light-duty, maximum traction application. The 127-inch wheelbase, $\frac{1}{2}$ -ton vehicles are available as cab-chassis, wide-box pickup and conventional box pickup models rated from 4900 to 5600 lbs. gross vehicle weight.

All Chevrolet 4-wheel drive units for 1961 feature a 10-inch diameter clutch, standard 3-speed transmission, and 7.10 x 15-inch tires on the $\frac{1}{2}$ -ton models. Thus equipped, they meet the majority of light-duty, maximum traction requirements.

Chevrolet has also introduced the "Corvair 95"—a new series of short wheelbase, rear powered, light-duty trucks. Designed for maximum utility of cargo space and load capacity, these trucks have a 95-in. wheelbase and overall length of less than 15 ft.

Comprising a panel delivery and two pickup models, the "Corvair 95" line is powered by the 80 hp. air-cooled Corvair six-cylinder engine and transaxle power unit mounted at the rear. Other features are unit-frame construction, independent coil spring suspension at all four wheels, and almost equal load weight distribution between front and rear wheels.



Chevrolet Corvair Ramp-Side Pickup

DODGE A Dart half-ton pick-up headlines the series of light and medium-tonnage 1961 Dodge trucks. The new models feature inclined 6-cylinder gasoline engines. Stressed are the passenger car styling and handling characteristics of the 1961 trucks and the fuel economy to be derived from the new 6-cylinder engines.

The larger of the inclined engines develops 140 horsepower in a displacement of 225 cubic inches. Dodge also is offering a smaller 101-horsepower, 170-cubic-inch inclined 6-cylinder engine. 140 basic models will be available in the 1961 line, which includes conventional-cab, cab-forward, 4-wheel-drive, forward-control, school bus chassis, and tandem units; 11 gasoline engines will be offered



Above, Dodge Tradesman for Utilities

Below, Dodge CT-800 with Dump Body



ranging in horsepower from 101 to 228. Eight diesel engines, ranging in horsepower from 160 to 250, will also be available. Gross vehicle weight ratings on the new trucks range to 53,000 lbs. and gross combination weight ratings to 76,800 lbs.

In addition to the Dart pick-up, Dodge is introducing a compact three-quarter-ton forward-control unit. Highly maneuverable on its short 104-inch wheelbase and available with either the 101-horsepower or the 140-horsepower inclined engine, it has a maximum gross vehicle weight rating of 7,500 pounds. A highlight of the new trucks is a 35-ampere alternator, which replaces the conventional generator. The box width has been increased 4 inches, boosting cubic volume capacity 10 percent.

BROCKWAY

Brockway Huskies, manufactured in Cortland, N.Y., are designed for year-round heavy hauling. One new model, 260LQ, incorporates several features that make it especially suitable for conversion to a snowplow. Usually equipped with at least a 10-yard body, this model is a 10-wheel truck. When the body is filled, the power wheels are under the weight for maximum traction. It has a short turning radius.



Heavy-Duty Brockway Huskie

radius and a new muffler of the horizontal under-frame type with inlet and outlet both on the front end. This allows the exhaust to enter the muffler in the usual way, but brings it out the same way, permitting the exhaust pipe to run up along the rear quarter of the cab. Piping the exhaust upwards, diesel-style, prevents plugging when backing the truck into deep snow drifts.

The 260LQ's 4 x 6 tandem axle chassis has inter-axle differential and a differential lock-out. One or both axles may be engaged or disengaged for power variations dictated by the type of work the truck is performing.

VOLKSWAGEN

A truck which can deliver profitably 1,830 pounds of material or rush a single gallon of paint to a crew, the Volkswagen was pioneered specifically to do such chores and many more. It was subjected to wind-tunnel tests to perfect a design that would minimize wind resistance and thus reduce consumption of gasoline. This truck is big brother to the Volkswagen sedan.

The truck has loading space directly between the axles. The weight is well balanced with the driver in front and the counterweight of the engine in the rear. Axle pressure



Volkswagen Transporter

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Volkswagen Pickup with Double Cabin

is then even 1:1 regardless of whether the vehicle is loaded or empty. Consequently erratic wear and tear on brakes and tires is eliminated, payload increases and over-all operation is more economical than in the standard vehicles of this size.

The most striking feature of the VW Pick-up is the existence of two loading floors arranged one above the other. The main loading deck has an unobstructed area of 45 sq. ft.; hardwood rails guard against load shift and slippage.

The VW Pick-up with double cabin and flat loading platform caters to two basically different transport needs. The sides and tailgate of the platform, which is at ramp level, are separately hinged, so it can be loaded easily from all sides in a matter of minutes. There is room for six people in the two cabins. This vehicle is a boon to engineers, contractors, inspection parties and other field crews.



GMC Truck with Taylor Dump Body

GMC

A lineup of trucks, ranging from the compact GMC Junior Van to various heavy-duty highway tractors, are offered by the GMC Truck & Coach Division for 1961. Trucks include a Suburban station wagon, GMC Junior Van package delivery truck, a Wide-Side pickup, a DF7105 aluminum tilt-cab diesel highway tractor, a BW5500 tandem-axle tractor powered by a 401 V-6 engine, and an L7000 steel tilt cab tractor.

The smallest model will be the Junior Van, a unit shorter than American-made compact cars yet having the bulk load capacity of a one-ton stake truck. At the other end of the scale will be the DF7105. Powered by a V-8 diesel engine (8V-71) developing 236 gross horsepower, this highway tractor has a gross combination weight rating of 76,800 pounds compared with the Junior Van's 7,500-pound rating.



SNOW REMOVAL

AFTER 19-INCH STORM

Crews were out all night plowing main arteries and clearing side streets. Most Milwaukeeans got to work with little trouble. But many living in the suburban areas could not be reached until Friday, and then only with snow blowers and huge V-plows mounted on 4-wheel drive trucks rented from Waukesha and Ozaukee County Highway Departments and some from municipalities as far north as Fond du Lac, about 60 miles away.

According to Raymond Hahn, Assistant Superintendent of Public Works, the City of West Allis, like other metropolitan Milwaukee communities, used anything they could get hold of to move snow. Two TL-12 TractoLoaders, owned by the Department of Public Works, were fitted with V-plows on Wednesday and worked that evening clearing alleys. Also on the alley detail in West Allis were five short-wheelbase trucks, some with mounted air compressors.

gaged in loading operations. Last February's heavy storm is remembered by officials planning for this winter's snow removal work; they hope for less snow.

Eleven jeeps plowed sidewalks. Five of them broke down trying to buck huge drifts. About 20 trucks, including dump trucks and trucks with mounted sand spreaders, tackled the job of plowing West Allis' 150 miles of streets. The City owns about 40 trucks and Hahn estimated that approximately 20 were working at any given time. There were more than the usual number of breakdowns because of the extremely heavy snow.

Five graders were also used, including an Allis-Chalmers Model D owned by the Department of Public Works, and another Model D owned by the Park Board. Both have gasoline engines. A Model AD-40 motor grader was also used, along with two rented graders. Although none was equipped with plows, their blades were used to clean up rutted streets and widen main arterials.

Parking Lots Next

By 5 a.m. Thursday, the two TL-12 Diesels had their V-plows replaced with 2-cu. yd. snow buckets. Along with the TractoLoader owned by the Park Board, they began cleaning out the seven municipally-owned offstreet parking lots paralleling Greenfield Avenue between 71st and 76th Streets. Snow was loaded into trucks which carted it

A SNOW emergency was declared by West Allis city officials on a Wednesday, the day of the storm. It had become apparent that the snow, driven by northeast winds up to 65 mph, would seriously affect movement of traffic. By 8 a.m. there was already about a 6-inch snow on the ground and sizeable drifts hampered efforts to get to work. Many schools never opened. By early afternoon, the few schools that had opened sent pupils home and most factories and offices closed.

Throughout the day, crews attempted to keep open main traffic arteries in the metropolitan Milwaukee, Wis. area, of which West Allis is a part. The storm was centered in Racine County, about 15 miles south of Milwaukee. Here traffic was at a virtual standstill on Interstate 94 between Milwaukee and Chicago. One driver spent 37 hours in the cab of his truck before plows reached him.

In metropolitan Milwaukee traffic was able to move slowly and most main routes were kept open. But many roads in outlying areas drifted shut almost as fast as they were plowed. When the snow stopped Wednesday evening with 19 inches on the ground, strong winds kept piling snow in drifts, many 6 and 8 feet deep.



● CLEARING snow from a high school yard. An Allis-Chalmers tractor loader picks up snow and loads it into a truck. City owns the loader; Park Board men operate it.

off to be dumped on the parking areas at State Fair Park, 6 blocks away. A snow loader worked with the three units until it broke down. Three other snow loading machines were used to widen intersections and remove snow from sidewalks in areas where snow was too deep to be plowed with a jeep.

Following snow removal at the

parking lots, Thursday and Friday morning, two units began making the rounds of 21 public grade and high schools in District 1, which includes West Allis and West Milwaukee. There they widened driveways and sidewalks in areas where the jeeps couldn't work. Trucks were loaded in 2 or 3 passes and snow taken away to be dumped at

nearby parking lots and baseball diamonds. Schools where oil and coal supplies were running low were serviced first so that deliveries could be made.

The third TractoLoader, owned by the Department of Public Works, began clearing snow from bus stops. It also was used to clear snow from corners at major intersections. Saturday, one unit worked with Park Board trucks and plows owned by the Department of Public Works to clear church parking lots and playgrounds at parochial schools. This is a standard practice, which is completed under normal conditions before the weekend so the areas are ready for Sunday services. Time was more pressing in this snow storm and crews worked 16 hours on Saturday to get the job done.

Although the Park Board, with 58 men, added no extras for snow removal, the Department of Public Works hired an additional 50 men to clear crosswalks with shovels, bringing its total force to about 250 men. About 12 additional dump trucks were hired from private contractors to assist in snow removal.

The big storm of last February 10 was often on the minds of West Allis officials as the final plans and preparations for this winter's program were completed.

Remotely Controlled Pump Station Saves Money for Industry

THE Thomas A. Edison Industries installation in West Orange, New Jersey, is headquarters for three of the company's largest divisions; Voicewriter, Storage Battery and Instrument. Products of these divisions are office dictating and transcribing equipment, Edison storage batteries and aircraft and industrial instruments. The divisions use 188 million gallons of water a year for processing, air conditioning, heating, sanitary use, and fire sprinkler system, and the company uses three independent water supplies. In addition to the wells which supply the bulk of the water used throughout the year, the system is tied in to the Orange city water supply and the Commonwealth Water Company system which supplies the Town of West Orange.

Normally the pumpage from the wells is about 500 gpm at 80 psi, most of it used by the Storage Bat-

tery Division for plating and processing. About two years ago, in order to lower our operating costs, automatic controls were installed which permitted operating the pumps remotely from the steam generating station about three blocks away.

An automatic pressure regulating valve was installed to cut in the Orange water supply should the pressure drop due to the company's supply running low or to failure of the pumps. However, it was still difficult for the operator to tell when this had happened since the water pressure near the controls in the steam generating station could vary as much as 40 lbs. from that at the pumping station. It was necessary to check the pumping station every watch and every time the pressure at the controls dropped below 50 lbs., the automatic cut-in point.

In order to eliminate this chore, an Instrument Division Omnidguard resistance pressure detector was installed at the pump discharge and an Omnidguard monitor and indicator mounted at the control station. Since the signal from the detector is transmitted electrically to the instruments three blocks away, a true measure of the pressure is now available to the operator at all times. Should the pressure drop below 50 lbs. due to pump failure or other cause, an alarm is indicated and a man is sent to the pumping station.

A standby pump is usually cut in immediately for two reasons: First, the cost of buying the large amount of water used is high; and second, the city water supplies are already being heavily burdened due to the rapid growth of the community. The principal reason for having three independent sources is to assure an adequate supply to the fire sprinkling system at all times.

Cost of all of the control instruments and piping alterations to remotely operate the pumping station was \$8,140, resulting in an annual saving to the company of \$20,000.

COOPERATIVE PLANNING SOLVES POLLUTION CONTROL PROBLEMS

G. S. RAWLINS

Consulting Engineer,

J. N. Pease and Company,
Charlotte, North Carolina

THE ARRANGEMENT which has been in effect for some time between the Town of Morganton, North Carolina, and certain state institutions, is a good example of the way in which joint ownership or operation can most efficiently solve a waste water problem. Another example is the cooperative effort at Concord, North Carolina, where the City and several major industries have worked together toward the construction and operation of a waste treatment plant for the treatment of industrial and domestic wastes.

City and State Institutions

The wastes being treated at Morganton are a combination of domestic and industrial from the Town and domestic wastes from both the Broughton State Hospital, an institution for mental defectives, and the State School for the Deaf. Here are the events leading up to acceptance of the agreement for the combined project.

In 1945, J. N. Pease and Company entered into an agreement with the Town of Morganton to furnish engineering services in connection with water supply and sewerage works improvement programs. Planning loans were obtained by the Town through the Federal Works Agency. The water supply problems were handled first because of the urgency for action.

During 1946 an investigation was made of the sewer and sewage treatment problems. At that time all sanitary sewers of both the Town and the State Institutions discharged to the receiving streams without treatment. The Engineers' report of December, 1946, gave consideration to providing for the Town's requirements only and also for the Town and State Institutions combined.

A proposal was made by the Town suggesting a division of cost of the outfall sewer and treatment plant between the Town and the State Institutions. This was based on the proportion of the design assigned to each principal according to the relative quantities of waste contributed

and the degree of biological treatment needed. For the treatment plant, the estimated cost of the principal units was split up either on the basis of flow or strength of sewage. This resulted in an assessment of 58 percent to the Town and 42 percent to the State.

No action was taken by the State on this proposal. Finally, the Town authorized the Engineers to proceed with plans for the outfall based on

mainly inactive until late in 1953. During this interval the State Legislature appropriated additional funds for institutional sewage treatment and conversations looking toward agreement were resumed. The differences between the two parties were resolved and late in 1955 the Engineers were directed to prepare a report and design analysis which would provide for a combined project. This was done and the re-



● AERIAL view of Morganton plant showing sludge beds in front, then the filters, and behind them the primary and secondary clarifiers, with digesters in the rear.

a combined project but with the treatment plant limited to the needs of the Town. The design analysis was such that the Town's needs were approximately double those of the State. Plans were prepared for two-thirds of the combined requirements with provisions for additions should the points of view of the two parties be reconciled. At that time the attitude of the two parties was not conducive to agreement. The State Legislature had appropriated some money for sewage treatment but it was insufficient to cover the cost as proposed. The State administrative personnel were not in agreement with the basis for sharing the cost.

On completion of the plans and specifications, the Town obtained approval of them from the State Board of Health and then postponed action on financing. The project re-

port approved. The drawings and specifications were revised, bids received and the facilities constructed.

The basic provisions of the agreement between the Town and the State included a division of the cost of construction of the common outfall and the treatment plant together with an agreement to share operating costs. The State contributed to the Town 34.7 percent of the cost of construction. The facilities are the property of the Town. Operating costs are shared proportionally on the basis of measured flow from the State Institutions and from the Town, with the State being charged an additional fee on a percentage basis for the administrative costs.

This combined project has been operating successfully and it is believed that the capital and the operating costs are considerably less

than would have been the case had the Town and State gone their separate ways.

Municipality-Industry Example

Concord, N. C., provides an example of cooperation between a municipality and its industries. This municipality had a population of about 16,500 at the 1950 census. In 1957, when the study was started, the Light and Water Department estimated that there were about 6,000 water taps, including some beyond the city limits. Concord has a heavy concentration of large water using industries, preponderately textile. Except for a small residential area, neither domestic nor industrial wastes were being treated. Even though the receiving stream had been given an "E" classification by the State Stream Sanitation Committee, the problem of pollution abatement was a very difficult and costly one.

The Engineers were employed by the City and were authorized to proceed with a study of the problem and to prepare recommendations on the advisability of developing a combined domestic and industrial waste treatment plant. The development of a sewer use ordinance was a part of the assignment.

Through cooperation of the major industries a sampling and flow gaging program was undertaken by the Engineers. A very extensive series of tests was conducted. The City's water plant laboratory was set up to perform the laboratory work with City personnel. One industry, a bleaching and finishing works and

the largest contributor of waste, ran parallel tests on its wastes in its own laboratory using samples obtained by the Engineers. The results from the two laboratories were generally within acceptable limits but any differences were immediately reconciled or the tests re-run.

While no accurate record was retained of the total number of individual tests, there were probably about twelve hundred. The Engineers believe that the sampling program was very worthwhile, both from the standpoint of design considerations and because it engendered confidence of both the municipal officials and industry in the design criteria and the sewer use ordinance which were proposed in the Engineers' Report.

Sewer Use Ordinance

Several conferences were held between the Engineers and City officials to explore the philosophy of sewer use ordinances. In the case of Concord, the City's existence is dependent upon its industries. The cost of pollution abatement will be reflected in the well-being of the citizens and the prosperity of the industries, which are very closely inter-related.

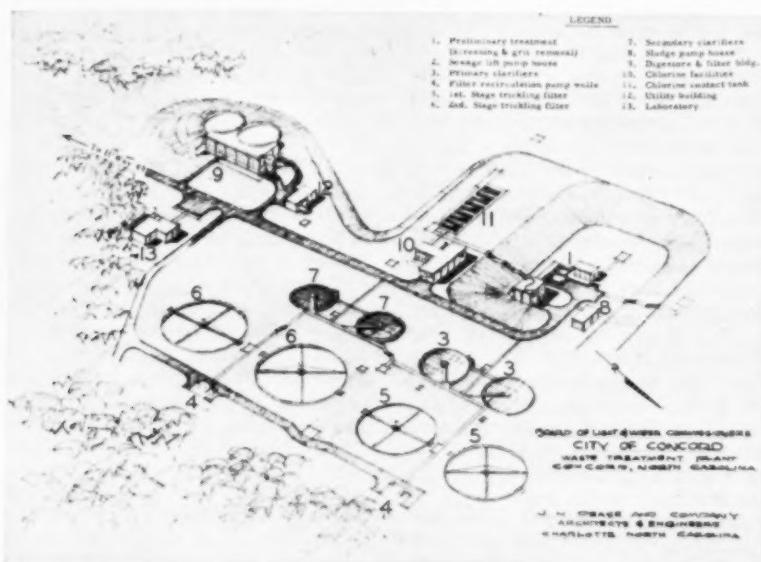
The Engineers prepared a so-called "Basic Ordinance" which included provisions for a surcharge on industrial wastes together with the associated provisions for measuring and testing. An "Alternate Ordinance" which contained the usual provisions for sewer usage and control but did not provide for a surcharge also was prepared.

The City Board of Light and Water Commissioners considered these proposed ordinances at length and held public meetings to acquaint industrial management with their provisions. It developed that industry recognized its obligations to participate in the increased cost and was willing to support the bond election and increase in water rates which would support the increased costs.

The bond election was preceded by a well-conducted program of education through meetings with civic clubs, newspaper publicity and like devices for informing the public. No organized opposition developed and the bond issue carried with a favorable vote of approximately 90 percent. Contracts for the construction were awarded last February. As of October 1, construction on the plant was approximately 50 percent completed.

The operation of the program, as effected by the Sewer Use Ordinance, will be watched with interest. The Engineers recommended that the City appoint a committee of five members representing industries contributing wastes to the sewer system to meet with the Superintendent of the Board of Light and Water Commissioners periodically to discuss mutual problems arising from the operation of the ordinance and treatment plant. This committee would be advisory only but it might well help to maintain the present attitude of good will between industry and the City.

This is a slight condensation of a paper presented by Mr. Rawlins at the Ninth Annual Southern Municipal and Industrial Waste Conference held in Raleigh, North Carolina.



● PLAN FOR complete treatment works for Concord. Industrial wastes represented a large proportion of the flow. An extensive sampling program preceded plant design.

Traffic Signals and Traffic Accidents

The Bureau of Engineering of the City and County of San Francisco, through the Division of Traffic Engineering, made a complete 2 years before and 2 years after study of 201 signalized intersections. The study showed that at the 106 intersections where less than five accidents occurred per year before signals were installed there had been an increase in accident experience. At those intersections where more than five accidents per year had occurred, the accident rate had decreased; and the more accidents in this group before signalization, the greater the reduction in accidents through signalization.

ROCKVILLE PLANS FOR 1980

WALTER A. SCHEIBER

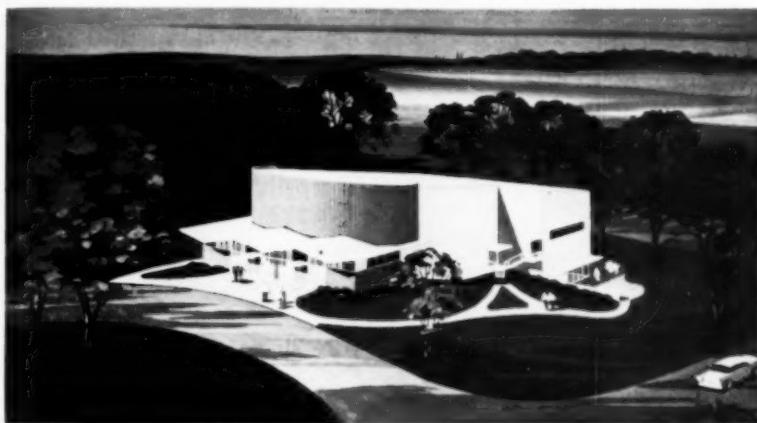
City Manager

Rockville, Maryland

ROCKVILLE, Maryland, which has grown explosively in the past 20 years, recently became the first Maryland city to complete a comprehensive blueprint for the next 20. Located approximately 15 miles northwest of Washington, D. C., Rockville has felt the full impact of the population boom which has rocked suburbia since the end of World War II. A sleepy, rural county seat of 2,000 people in 1940, the community has mushroomed since the war into a thriving city of more than 25,000. Most of this growth has taken place in the past 12 years.

The population explosion has skyrocketed Rockville from 14th to 4th place among Maryland's municipalities in population in just 10 years, and has made it the largest Maryland municipality in the Washington metropolitan area. Projections made in connection with the City's Master Plan indicate that by 1970 Rockville will be second in size only to Baltimore among Maryland cities. Aware not only of this striking population increase but also of the community's tremendous growth potential, the City Planning Department late in 1958 began work on a comprehensive plan for the community. The project was financed jointly by the City and by the Housing and Home Finance Agency, under the provisions of Section 701 of the Housing Act of 1954. It was conducted under the supervision of Bruce A. Watts, City Planning Director, who worked in close conjunction with Professor Thomas F. Hubbard, of Johns Hopkins University, planning consultant for the Maryland State Planning Commission.

Goal of the plan was to provide a blueprint for Rockville's growth over the next 20 years, so that the City Council and the Planning Commission would have guidelines on which to ground their decisions concerning the City's development. Toward this end, the plan included general recommendations on such matters as ultimate annexation limits, (Rockville has had 22 annexations since 1940), utility expansion, major street and highway patterns,



● ARTIST'S sketch of the new civic auditorium, one of the many projects planned.

school locations, and other significant items. Key to the plan was a land use map, which indicated the location and size of all proposed residential, commercial and industrial areas.

Material for the plan was assembled in a series of studies by private consultants and the City staff. Four of the studies were prepared by planning consultants retained by the City. These four were: a Population and Economic Base Study, prepared by Ernest E. Blanche Associates of Kensington, Maryland; a Population and Economic Base Analysis, by Morton Hoffman of Baltimore; a Traffic, Parking and Highway Study, by Oscar Sutermeister, of Bethesda, Maryland; and a review of the City's water and sanitary sewer facilities by the engineering firm of Hayes, Seay, Mattern and Mattern, of Washington, D. C.

In addition to these surveys, the City staff undertook a series of studies of its own, including a review by the City Engineering Department of current and proposed storm drainage facilities; a study by the City Recreation Department of present and proposed park and recreation sites; and various special studies by the City Planning Department.

As finally released by the Planning Commission in March, the plan envisages a probable 1980 City population of 62,000, a doubling of the City's present seven square mile area, and concurrent growth of all the City's public facilities.

These include a municipal water system which derives its supply

from the Potomac River eight miles southwest of Rockville, two major trunk sewers which collect the City's sewage from some 66 miles of sewer mains and carry it through lines of the Washington Suburban Sanitary Commission to the District of Columbia's Blue Plains treatment plant, 72 miles of streets, 22 miles of open and closed storm sewer, and 10 City parks and playgrounds.

Additional Facilities Required

Fortunately for the City, many of the additional capital facilities required to serve Rockville's expanding population in the coming years will be built and paid for by private developers. Under the City's subdivision regulation ordinance, developers are required to build and turn over to the City all streets, sidewalks, storm drains, sanitary sewers and water lines within their subdivisions.

Thus, the City's capital investment will be limited to major additions to its utility system, construction of arterial streets and highways, acquisition of major parks, and other items which are primarily of general benefit.

The City has already started planning these major facilities. A new 4 m.g.d. filter plant completed in 1958 to replace the 38 deep wells which formerly served the City is so constructed that its capacity may be doubled with a minimum of difficulty and cost.

A third major trunk sewer, which will serve the west end of the City, is now under construction. When completed in the spring of 1961, it

will open up to development some 4,000 acres of former agricultural land. In addition, it will enable the City to eliminate three overloaded and obsolescent sewage pumping stations which now pump over into an adjacent drainage basin. By 1980, the new sewer is expected to serve 11,300 people, as well as a substantial amount of new industry.

Rockville's proximity to the nation's capital has made it attractive to a variety of industries, particularly those in the field of research and development, which serve the nation's defense effort. As the county seat of Montgomery County, which calls itself "The Science-Industry County," Rockville has attracted its share of new industry during the past few years.

The Federal Systems Division of IBM, a new plant of Emerson Radio & Electronics Co., Washington Technological Associates, and

numerous smaller industries have set up their headquarters in Rockville since 1955.

Storm Drainage Is Problem

Rockville's rapid development has aggravated a problem which it has in common with many communities, that of storm drainage. Early growth in the City took place with little regard for the potential hazards which inadequate surface drainage facilities would ultimately create. The City is now faced with construction of some \$3.2 million in drainage facilities in the older sections of Rockville over the next 20 years.

As a first installment on a storm drainage construction program, the City Council this year appropriated \$475,000 to relieve the most acute problem areas. The City Manager has recommended construction of an additional \$222,700 in facilities in the coming year. A third phase,

estimated to cost approximately \$1.6 million, is now under design by the City's consultants, Hayes, Seay, Mattern and Mattern, through a planning advance from the Community Facilities Administration of the Housing and Home Finance Agency.

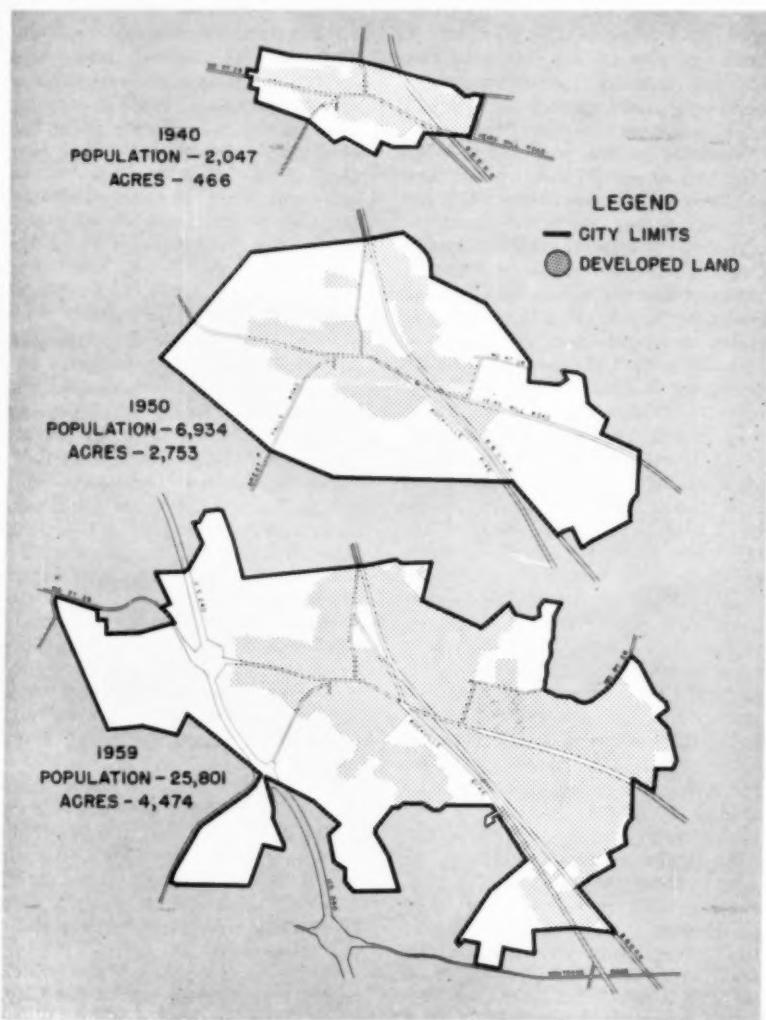
Rockville is bisected by the main westbound line of the Baltimore & Ohio Railroad, as well as by two major highways. The first of these, Maryland State Route 355, links the City with Washington on the south and Frederick, Md., on the north. The second, Interstate Route 70-S (U.S. Route 240), is Washington's main gateway to the west. These roads, and several others in the City, are under the jurisdiction of the Maryland State Roads Commission.

The City, however, is responsible for the maintenance of some 72 miles of streets, of which approximately 67 are paved. Public Works Director John Gray maintains City streets with two five-man crews. These, and four other crews responsible for sewers, water distribution, and parks, comprise the City's maintenance force. They utilize a fleet of 20 trucks, a Hough Payloader, Case 320 backhoe, an Adams 220 grader, Galion 10-ton tandem roller and smaller equipment in the course of their activities. A Motorola private line radio system installed in 1959 has proved invaluable in coordinating the City's public works efforts.

Under the Master Plan, a doubling in primary and secondary street mileage by 1980 is anticipated. In addition, 12 miles of new arterial streets and seven miles of major or limited access highway are projected. A substantial portion of the latter, to be built by the Maryland State Roads Commission, will constitute the Rockville leg of the Washington Outer Belt, recently renamed the Capital Beltway.

Community interest in the new plan has been high. More than 400 copies of the plan were distributed to residents of Rockville during the first two weeks it was available to the public. A fresh supply of master plan reports had to be ordered from the printer. Approximately 225 residents attended the public hearing held by the City Planning Commission.

The total cost of the plan is estimated at \$25,200, of which the Federal Government contributed approximately \$12,600. Rockville residents are confident that the benefits to be reaped from it will far exceed this relatively small outlay.



● GROWTH of Rockville is shown by the area and population figures listed above.

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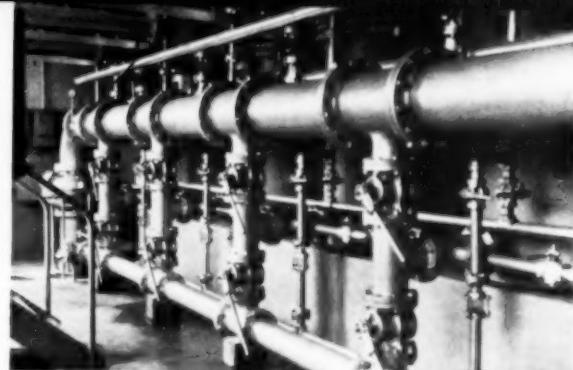
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• DIATOMITE filter installation is in the white building; in the foreground are two clearwater basins, with outlet gates.



• PIPING and controls for the diatomite filters. The six units in the foreground are two clearwater basins, with outlet gates.

DIATOMITE FILTRATION PROVES ECONOMICAL STANDBY FOR WATER PLANT

HOWARD HARDING

Superintendent of Public Works,
Hudson, New York

FOR MORE than sixty years, the water supply for the City of Hudson, New York, has been an upland creek feeding an 80-million-gallon reservoir. The water flows by gravity through a 23,000-sq. ft. slow sand filter into clear wells and thence, by gravity, to the city. Filter maintenance involved scraping, which was done 2 or 3 times a year, the operation requiring a week to 10 days each time. During these timeouts, unfiltered water was supplied. To further complicate matters, it became obvious some time ago that the filter bed which had served so long would need complete overhauling—a nine-month job. This necessitated standby capacity.

For this auxiliary capacity, two methods were considered—conventional rapid sand filtration and diatomite filtration. Since installed cost of the latter was a fraction of the sand installation, and because of other inherent advantages of diatomaceous earth filtration, this was chosen.

Six 238-sq. ft. Adams Poro-Stone filters were installed for filtration of the entire city water supply, which averages 2 mgd on a design basis of 1 gal. per sq. ft. per min. for the Adams units. Total installed cost was \$65,000 or about \$48 per sq. ft. The plant, designed by the writer and furnished and installed by Schultz-Forster Associates, Inc. of Troy, New York, is compact, attrac-

tive and easily maintained. In operation from February to December, 1959, the plant performed to complete satisfaction, without difficulties of any kind, and delivered water of excellent clarity at a minimum cost. Total cost per 1000 gallons—including depreciation, interest, labor, power, filter-aid and other expenses has averaged between 3 and 4 cents.

In operation the filter pump suction is taken from the gravity feed line to the slow sand filters, the pump feeding a header distributing to all six filters. An orifice flow meter is in each filter outlet, and flow rate is manually controlled when desired. Effluent is discharged into the two clearwells used for the sand filter, and their bottoms can be clearly seen through 17 feet of water. Turbidity of the raw water, it should be noted, varies from 8 to 15 ppm with frequent heavy concentrations of amorphous matter through the warmer months. Algae, present in varying quantities, had given trouble in slow sand filter operation, but were handled without difficulty with the new plant.

Precoating and feeding are as follows. Filters are precoated one at a time with Hyflo (Johns-Manville, Celite Division) diatomaceous earth. Filter aid is continuously added by means of a dry feeder system. No trouble has been experienced with preferential body feeding.

Filter cycles normally run 24 hours, using 150 lbs/day of Hyflo for precoating and 200 lbs/day of Celite 545 as body feed, or 12 mg/L body feed for 2 mgd consumption. This, plus power costs, comes to \$30 per day or 1½ cents/1000 gallons.

The filter cake, built up on the Adams Poro-Stone filter elements by precoat and body feed has millions of microscopic passages which trap particles down to bacteria-size, reducing chlorine demand and eliminating the need for other chemicals. This results in a highly polished water of unusual clarity at minimum cost.

Backwashing is performed, one filter at a time, utilizing filtered water. First the unit is vented and completely drained. With the discharge valves closed, atmospheric air in each unit is compressed into the pressure dome by the incoming filtered water. At 50 to 60 psig this compressed air head develops dynamic high reverse water velocities necessary to purge completely the filter elements of cake. Cleaning and precoating requires about 10 minutes per filter. Backwash uses 500 gallons of filtered water per filter unit. The normal manpower requirements to operate and maintain the plant are handled by the Water Department foreman and a helper working 2 to 3 hours daily.

Present arrangements call for the use of this plant whenever water conditions are unfavorable to the satisfactory performance of the sand filter and when otherwise necessary. In May, 1960, with only a few hours notice, the plant was placed into operation at full 2 mgd capacity. It immediately produced top quality water far superior to that of the sand filter system. The diatomaceous earth system will continue operation throughout difficult periods as with high turbidity raw water during spring runoff.

WHY WAIT FOR COMPLAINTS?

To forestall possible complaints from residents living near the sewage treatment plant, and as part of its public relations program, the Sewer Commission of Port Washington, N. Y., has provided an extensive odor control installation at vulnerable points in the plant and sewer system.

JOHN M. POLLOCK
Chairman, Board of Commissioners,
Port Washington Sewer District,
Port Washington, New York

MANY sewer commissions consider that their obligations have been fulfilled with the provision of a well designed and efficiently operated sewage treatment plant. Port Washington, Long Island, however, does not believe this to be sufficient.

The Port Washington Sewer Commission completed a plant in 1952, intended to be adequate for the expected expansion of the community until 1965. Therefore, the plant was designed to handle 3 mgd although present volume of domestic waste treated is 2 mgd.

The main building of the Port Washington plant is a converted sand loading tunnel constructed of two-foot thick reinforced concrete walls. Rather than demolish the 204-ft.

long structure, the Sewer Commission decided in the interest of economy to adapt the building to the needs of the plant. The building now houses the plant offices, laboratory, chlorine room, control center, water well system for the plant, garage, shop, boiler room and locker room. Adjacent to the control center is a 30-KW diesel generator for emergency standby power.

The plant is a bio-filtration type with primary clarifiers, high rate trickling filters, secondary clarifiers and primary and secondary digesters. The clarifiers and filters are in duplicate. A degritter and comminutor are also provided. Good engineering practice was followed in every aspect of control instrumentation.

However, good design and operating practices do not necessarily make a sewage plant a graciously accepted part of community existence. Breaking down the prej-

udice against a sewage plant in a built up area is a problem. This phase of sewage plant management responsibility was seriously considered by the Port Washington Sewer Commission.

While the plant was in the planning stage, the Commission realized that a location isolated from residential areas would be vital for good relations with the community. Port Washington has a high proportion of high income families with relatively expensive homes, making it almost mandatory that the sewage treatment facilities be insulated from the residential sections.

In selecting the old sand bank the Commission found an area well isolated from Port Washington's already established homes. The 27-acre site was large enough to provide ample room for the necessary plant as well as a larger buffer zone. An area of twelve acres was



● PUBLIC RELATIONS required that every precaution be taken to prevent odor complaints from homes shown nearby.



● SCAVENGER wastes disposal presents a problem due to possible production of odors if spillage occurs. Special receiving tank is used and wastes pumped to plant.

set aside for a community recreation field and ball park, the first step in establishing a positive relationship with the citizens and taxpayers of Port Washington.

Basic to the philosophy of good public relations above all, is the extensive plant and system odor control program. About two years after the plant was built, Superintendent Ralph Thomas recommended to the Commission that the odor producing potential be investigated before it became a problem. Accordingly, the Commission called in Airkem, Inc., a firm of odor control engineers to check the requirements for thorough protection against odors arising from plant pumping stations and sewage lines.

A survey of the Port Washington facilities indicated a need for odor control installations at the plant itself because of the topography of the area. The plant is in a hollow, with new residential areas surrounding it. As a consequence, fixed odor control guns were located at several key points. In addition, portable units were recommended for spot use, in the event of unusual conditions.

Odor control units were placed at the degritter tank, both primary clarifiers and trickling filters. The guns are operated by the plant air line and supplied by individual drums of Airkem counteractants. The counteractants reduce the odor level without masking. It has been found that this is the only way to please all the residents, since a covering odor may be pleasant to some, offensive to others.

An interesting aspect of Port Washington public relations is the effort to reduce operating expense by servicing scavenger trucks; the fees obtained from the scavenger

operations help defray costs. The problem of spot odor control at the receiving point was solved through the use of a portable unit put in place when the trucks are drained.

No industrial wastes are received in the system; nor are there any design characteristics which contribute to an odor problem except one pump station converted from an Imhoff tank. The manner of flow through this station creates an odor problem.

All twelve pumping stations of the Port Washington system are equipped with odor control units. One of the most sensitive locations is at a point adjacent to a yacht club and quite near a public park and bathing spot. No complaints have

arisen from either the club or the public. The summer months, May through September, are critical for odor control in the Port Washington area. The conditions of high humidity at that time generally magnify the problem. Operating primarily during these months, the program costs between \$800 and \$900 per year.

This careful consideration of the public is reflected in an event called "Grievance Night" wherein the public is invited to register protests or complaints about tax matters, administration or operating conditions. Because of its positive approach, the Sewer Commission rarely has a complaining citizen to cope with. Emergency problems, when they arise, are serviced on a 24-hour basis through the use of a telephone answering service.

An additional benefit to the Sewer Commission of its public relations approach resulting from the high regard it holds in the public mind, is the remarkably low turnover in personnel. In over 50 years, the Commission has had but two plant superintendents. Staff personnel have comparable employment records.

Planning a good relationship with the community has paid dividends for the Port Washington Sewer Commission. The plant has never failed to gain acceptance from the voters whenever additional funds for expansion have been requested. Here is positive proof of the value of good public relations.



● AERIAL view shows the nature of the odor problem. A playground, upper center, adjoins plant property; and residential areas nearly surround the site of the plant.

Chemicals — CONTROL WEEDS IN EIGHT PROBLEM AREAS

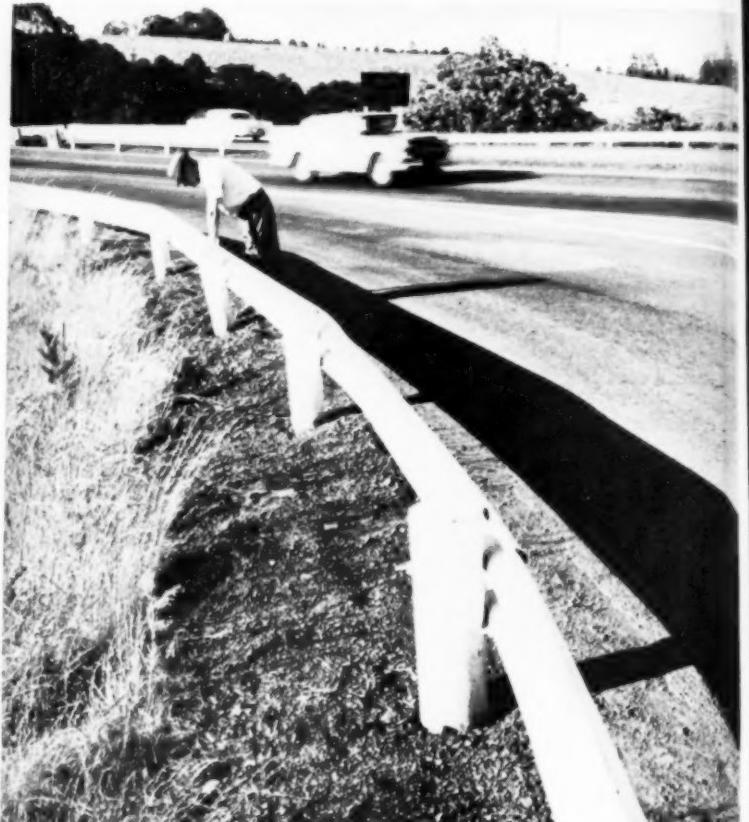
WM. H. KOSESAN

Agronomist, Maintenance Division,
Oregon State Highway Commission,
Salem, Oregon

This article is based in part on a paper presented by Mr. Kosesan before the 1960 meeting of the Weed Society of America.

THE MONEY invested in chemicals for roadside weed control in Oregon has nearly tripled in the last five years, and now exceeds \$100,000 annually. Chemicals are used on 90 percent of our 7,500 miles of roads since we find that they are our best answer to better weed control at lower cost. Among the many types of chemicals available, the selective and non-selective herbicides are receiving an increasing share of attention in our program. They are being employed to take care of weeds in eight problem areas: 1) Around plantings at interchanges; 2) in hedges of multiflora roses; 3) on unpaved medians; 4) on shoulders; 5) under guardrails; 6) near bridges and culverts; 7) for making fireguards; and 8) around site and sign posts.

Non-selective herbicides are applied to the soil surface to kill existing growth and to prevent new growth for one to three or more years. The length of time they remain effective depends upon the material itself, the rate of application, the type of soil and the amount of rainfall. A moderate amount of rainfall is necessary to carry the chemicals down to the active weed rooting zone, although an excessive amount may take the materials too deep. That's why in the area west of the Cascade range of mountains, where rainfall averages as much as 35 to 70 in. or more annually, our applications are made in March to May to get away from the heavy winter rains. In the dry eastern Oregon area, with only 7 to 15 in. of rain, application is made in October to December so that full advantage is taken of the rain to activate the chemicals.



● NON-SELECTIVE herbicides under guard rails have greatly reduced costs of mowing and weeding, while improving appearance. All guard rails are treated.

Application Rates

The following are the rates we use for non-selective work in our two rainfall areas; however, once the area has been cleaned of vegetation, these rates are reduced by one half:

Western Oregon

Simazine 80W* - 19-25 lb./acre
Borate Chlorates - 4 lb./100 sq. ft.
Karmex Diuron - 30-40 lb./acre
*or Simazine 50W - 30-40 lb./acre

Eastern Oregon

Simazine 80W* - 6-12½ lb./acre
Borate Chlorates - 2 lb./100 sq. ft.
Karmex Diuron - -0-
*or Simazine 50W - 10-20 lb./acre

These materials will control most of the annual broadleaf weeds and grasses which are problems on our roadsides. In certain instances where extremely hardy, long-established weeds are found, we add 4 lbs. Aminotriazole or 2,4-D per 100 gal. to the Simazine or Karmex Diuron solution.

While we are still using the older chlorate-borate mixtures, we also used 2,400 lbs. of Karmex Diuron (E.I. duPont deNemours & Co. Inc.) and as much as 19,450 lbs. of Simazine (Geigy Agricultural Chemicals) during the 1959 season. We started with Simazine three years ago, and this herbicide is being used

more widely by us all the time. It controls annual broadleaf weeds and grasses and has a number of additional features we like. When applied properly, it is safe to our men, equipment and adjacent vegetation because it doesn't drift or leach laterally and it can be used both as a non-selective herbicide (at higher rates) and as a selective herbicide (at lower rates).

Weed-Free Shrub Beds

We have used chemicals for many different purposes, but one of the most dramatic applications is for selective weed control in shrub beds. For example, at the interchange in Albany, Oregon, where Route 20 crosses U S 99, there is a three-acre landscaped area with hedges, ornamentals and conifers. This used to cost us \$2,040 a year in weeding costs alone. Now, we spend \$288 for chemical and the labor to apply it and hand weeding is practically eliminated for the full year. The herbicide is applied with a power sprayer and hand gun around the plantings at the selective rate of only 5 lbs. of Simazine 80W per acre. Shrub beds are kept weed-free and since the chemical does not leach, there is a sharp, neat line between the lawn and the bed.

Embedded in the lawns on this interchange is a permanent sprinkler system. We spray the sprinkler heads to kill the grass in a one-foot radius. This makes the heads easily visible when mowing the lawn, and breakage of mower blades has been reduced drastically. The sprinklers also function better because they don't get plugged up with growth.

Hedges of multiflora rose can also present a weeding problem. In the median area of the R. H. Baldock Freeway, for example, we have sprayed at a low selective rate from the edge of the pavement down into the row of plants — an area very difficult to mow with power equipment. Control of weeds and grasses has been good in most locations and injury to the hedges has been very low.

Our biggest volumes of chemicals, applied at the non-selective rate, are used around the following problem areas: Every mile of guard rail is treated with Simazine or Karmex to eliminate trimming grass and pulling weeds; in narrow median strips not planted or paved, spraying eliminates the weeding problem; around site and sign posts along the right-of-way, application of chemicals makes it possible to mow without having to stop to lift sickle bars or follow up and trim missed

weeds by hand; around culverts and bridge ends, chemicals control growth and improve sight distances; as fireguards, we spray 16-foot strips along some of the highways in the Columbia River area where there are many wheat farms — the resulting vegetation-free strip reduces the danger of fires spreading up embankments into the wheat fields; and a 4-ft. to 10-ft. strip from the edge of the bladed shoulder is treated. On some road sections where the shoulders are not bladed because they are too narrow, the chemical is applied from the edge of the pavement.

In District 4A, the superintendent reports an average yearly maintenance cost of \$61.50 per mile with no chemical treatment. The yearly

maintenance cost on chemically treated shoulders is \$60.40 per mile the first year at the regular shoulder rate of 4-5 lbs. per acre; for the second and third years the cost is only \$33.90. This is a considerable saving, especially when considering that good appearance and visibility of treated shoulders cannot be shown money-wise.

Spraying Equipment

We use truck mounted, 300-gal. tanks with power sprayers to apply these materials. For application around guard rails and posts, we use a boom, mounted on the right side of the truck and controlled by an operator sitting next to the driver. It has a hand-operated control valve, hoses, and two nozzles —



● TRUCK-MOUNTED 300-gal. tank is used, with a power spray. For guard rails and posts, a boom, shown above, is mounted on the truck. Operation is by manual control.



● HERBICIDE was sprayed over a one-foot radius around this sprinkler head making it more visible for mower operators and permitting better watering job on lawn.



● SHRUB beds shown here were weeded chemically. The herbicide, when applied at a low selective rate, eliminated the need for hand-weeding and did not harm plantings.



● UNPAVED median strips are no longer mowed in Oregon. Use of herbicides permits faster mowing because work is constricted and awkward areas are eliminated.

one on each side of the guard rail or post. These nozzles are Teejet 8030 (made by Spraying Systems Company, Bellwood, Ill.) and each applies three gal. of spray a minute at 40 lbs. pressure.

When treating shoulders or fireguards, we use special booms which can be raised or lowered hydraulically or electrically over obstructions, posts and slopes. For shoulder applications, we use an 8-ft. boom and for fireguard spraying, a 12-ft. boom. The nozzles on these booms are usually Teejet 8006 or 8008, which apply up to 6 or 8 gal. per minute respectively at 40 lbs. pressure. Speed of travel is 5 mph when Simazine or Karmex Diuron are used, but we have to slow down to

1 mph when applying borate-chlorates.

Safety and Economy

This weed control program has greatly increased safety on Oregon highways. Sight distances on curves and intersections have been improved, guard rails are more visible, fire hazards have been reduced and the danger of accidents has been decreased. Another major feature of this program is that it has lowered our cost of roadside maintenance. We spend much less time mowing. The mowing we still do is faster because hand-cutting of grasses around posts and other obstructions has been eliminated. Drainage structures remain un-

clogged, saving the labor formerly spent removing mowed or dug-up vegetation. Weeding costs around plantings are much lower now as there is less damage to cutting and mowing equipment. Finally, these modern chemicals are helping to keep our roadsides neat and beautiful, pleasing to those living along our highways and attractive to passing motorists.

• • •

Refuse Collection and Disposal in Minnesota

Questionnaires sent out by the League of Minnesota Municipalities asking for information on refuse collection and disposal practices resulted in replies from 202 municipalities. Reports indicated that some form of municipal collection is provided in 51 out of 202 municipalities or approximately 25 per cent of the total; 25 or slightly less than half of these municipalities require compulsory use of the service by either householders or commercial establishments, or both; 36 of the municipalities report collection of all refuse.

Contract collection is less popular such a system is in operation in only 30 municipalities or approximately 15 percent. In 121 municipalities, property owners may have their own refuse or employ private haulers. No service of any kind is provided in 7 municipalities.

Of the municipalities answering 140 use land dumps for the disposal of one or more varieties of refuse; 13 exclude garbage from their dumps. Precautions against vermin either by covering or burning, or both was reported by 22 municipalities.

A sanitary land-fill or other method of burying refuse is practiced in 43 municipalities; 6 communities operate incineration plants although 2 of these expect to abandon this method in the near future. One city reported that it disposes of its garbage by processing it through the sewage disposal plant.

The use of household garbage grinders was reported by 89 municipalities, with 22 indicating use by 10 percent or more of the residences; 2 municipalities require installation in all newly constructed dwellings.

Refuse collection and disposal operations are financed out of general revenues (wholly or partially) in 53, or approximately 26 percent, of the municipalities but the predominant method of financing is by service charge.

Water Supply for Navigation on the Monongahela River

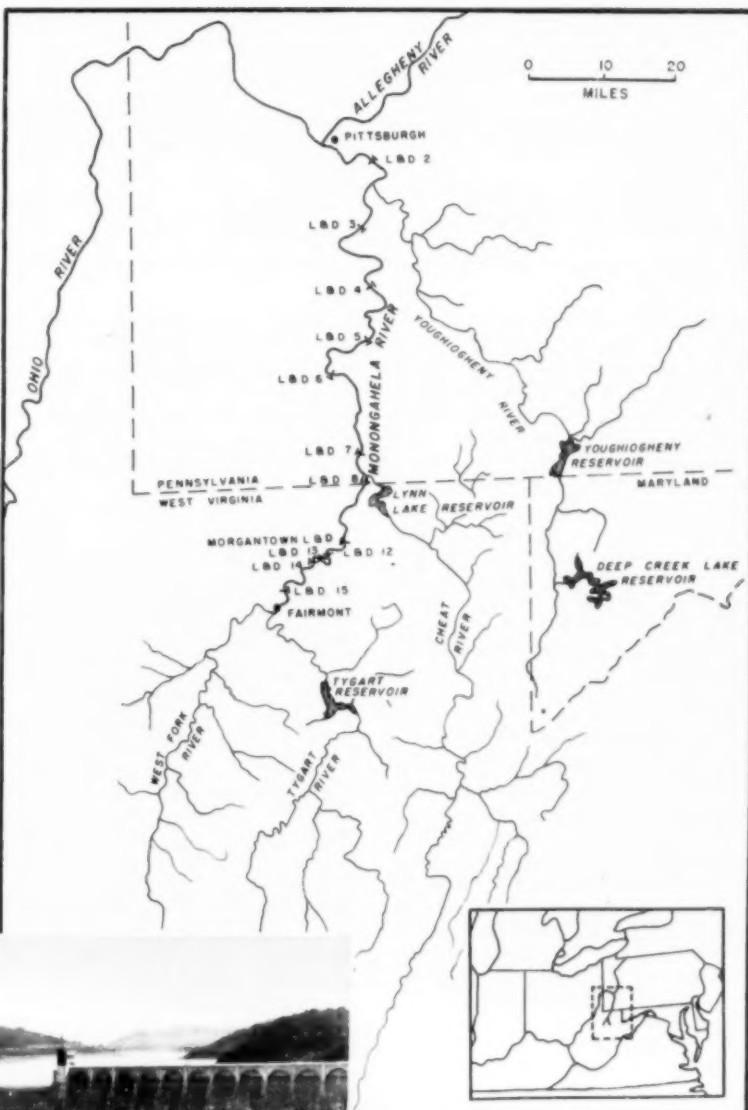
FRANK SEAWALL

Assistant Professor of Geography,
The Ohio State University,
Columbus, Ohio

AN ADEQUATE water supply is a prime necessity for reliable river navigation. Since the natural stream discharge is normally not uniform throughout the year, fluctuations in the water level cause problems in maintaining the proper water supply for navigation. On the Monongahela River this problem is twofold: 1) Providing sufficient water for navigation in the summer and autumn and 2) controlling the highwater stage in the winter and spring. A series of locks and dams on the Monongahela River, and four reservoirs on the tributaries aid in the control of the high and low water stages.

Normally, the high water stage on the Monongahela River is the most severe phase of the problem. High water may suspend navigation by flooding out the locks and making them inoperative. Traffic can proceed through the locks until the stage in the upper pool of a lock rises to within one half foot of the top of the lock walls; however, navigation is usually suspended at somewhat lower stages due to the velocity of the high water current.

Navigation is suspended more often due to high water in the lower



MAP SHOWS Monongahela river with its major tributaries, dams and reservoirs. Inset shows general location.

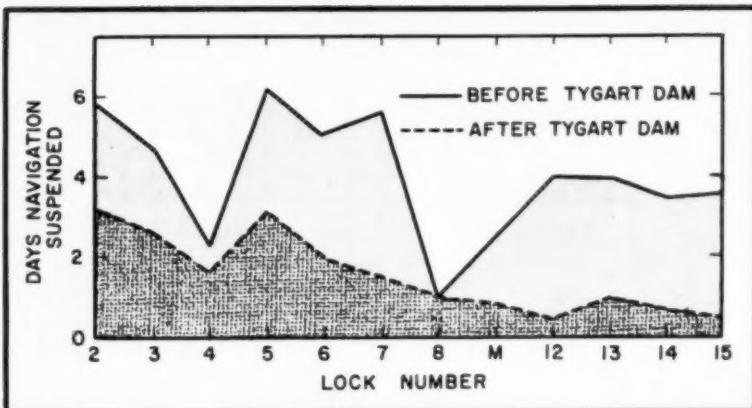


Courtesy Corps of Engineers, U. S. Army

TYGART RIVER reservoir dam has been the most effective of the four dams on the Monongahela tributaries in high and low water control of navigation.

river than in the upper river. This is caused by the relatively large amounts of water which are added to the lower Monongahela by the major tributaries, the Youghiogheny and Cheat Rivers, which flow into Pools 2 and 7, respectively.

Ordinarily the absolute minimum low water stage in pools controlled by dams, as in the Monongahela,



● EFFECT of Tygart Dam on suspension of navigation due to high water, based on a 32-year period of record. Map on the preceding page shows location of locks.

is considered to correspond very nearly with the crest elevation of the dam. When the volume of water required for lockages, plus the normal leakage past the locks and dams, exceed the natural flow of the river, the pools will recede below the dam crests. One of the historic low water periods on the Monongahela occurred during the drought of 1930, at which time navigation was completely suspended above Lock 7, and was maintained at a restricted rate below Lock 7 only by virtue of water obtained from a hydroelectric development on the lower Cheat River.

Effective Reservoir

Of the four dams and reservoirs located on the tributaries of the Monongahela, the Tygart Reservoir is the most effective in high and low water control for navigation. This reservoir, which was constructed in 1938, is located on the Tygart River which joins with the West Fork River at Fairmont, West Virginia, to form the Monongahela. This site provides partial control of the water supply of the entire Monongahela. The number of days when navigation was suspended due to high water has been reduced by 61 percent since the construction of this reservoir. It is evident that the upper Monongahela has benefited most from this dam; however, the effect of the dam is also noticed in the lower river. During the 32-year period of record, the maximum number of days per year when navigation was suspended due to high water was reduced from 18.5 days before completion of this dam to 7.5 days after construction of the Tygart Reservoir.

The Tygart Reservoir has also been an aid to navigation during periods of low water. Since the com-

pletion of this reservoir, navigation has never been interrupted due to low water, although water released from this reservoir has been instrumental in overcoming many low water periods. During the low water period from August 15 to October 29, 1939, the water released from the Tygart Reservoir supplied 69.5 percent of the water in the Monongahela at Lock 15 and 38.2 percent of the water at Lock 5. In the fall and early winter of 1952 and 1953, normal pool stages were maintained only by the release of navigation water stored in the Tygart Reservoir.

The Lynn Lake Reservoir on the lower Cheat River, which flows into Pool 7 on the Monongahela, can be used only for high and low water control for the middle and lower Monongahela. However, the primary function of this reservoir is for generation of hydroelectric power. Since the Deep Creek Lake and Youghiogheny Reservoirs store water from a relatively small segment of the Youghiogheny River Basin, these reservoirs are comparatively ineffectual in control of high and low water stages on the Monongahela River. Another factor which minimizes the control on the water stages of the Monongahela, is that the Youghiogheny River flows into the Monongahela only 15.6 miles from the mouth. As a result, these reservoirs have no real effect on water control above the mouth of the Youghiogheny.

Run-off Variations

Precipitation is critical in maintaining a water supply for navigation, as much of the water in the Monongahela River results from run-off. In the basin of the Monongahela River, the Corps of Engineers, U. S. Army, reports that

approximately 52 percent of the total precipitation runs off; this is a relatively high percentage by comparison with other drainage basins such as the Allegheny Basin where the estimated run-off is but 43 percent.

The seasonality of the run-off in the Monongahela Basin causes the high and low water stages of the river. An analysis of the mean monthly rate of run-off in the drainage basin, reveals that the five-month period from January through May accounts for nearly 65 percent of the total annual run-off. Mean monthly precipitation data shows that the spring season is the period of maximum precipitation, and when in combination with melting of the snow cover, run-off is increased. The lower winter and spring temperatures also increase run-off as less moisture is lost by evaporation when temperatures are low, hence, a greater proportion runs off. The lower winter temperatures also increase run-off when the frozen ground prohibits additions to the ground water. These factors cause the high water stage in the Monongahela in the period from January through May.

The normal low water period of the Monongahela River from July through November accounts for only 18 percent of the total annual run-off. This low water stage is caused by a lesser amount of precipitation in the autumn months and higher summer temperatures which cause a greater proportion of the precipitation to be evaporated, reducing run-off. The general lowering of the water table during the summer and autumn allows for a greater proportion of the precipitation to seep into the ground which also reduces run-off. As a result, the low water stage for navigation on the Monongahela occurs in the period from July through November.

Since a reliable water supply is critical for river navigation and fluctuations in high and low water stages are normal, this creates a problem in water control. The construction of locks and dams within a river is often essential for river navigation; however, additional water control is often necessary. This is illustrated by the results of the Tygart Reservoir, which made a marked improvement in the control of the high and low water stages on the Monongahela River.

All data used in this article originated from unpublished reports of the Corps of Engineers, U. S. Army, Pittsburgh District.



● BOROUGH garage with some equipment. L. to r: IHC tractor with Pippin backhoe; a Ford truck; and Plymouth station wagon.

Ordinance Creates Many Duties for MANAGER-ENGINEER

FRANK FORCE

Borough Manager-Engineer,
Hellertown, Pennsylvania

WITH an area of two square miles and a growing population, now about 7,000, Hellertown, Pa., passed an ordinance in 1958 creating the position of Manager-Engineer. A community of moderate-sized industries and well-kept homes, Hellertown is a part of the Allentown-Bethlehem-Easton area.

The ordinance establishing the office of Borough Manager-Engineer provided for the method of filling the office, the bond, compensation, powers and duties of the position. Following in a somewhat simplified form, are the points covered by this legislation.

The Office of Borough Manager was created subject to the right of the Borough, by ordinance, at any time to abolish the office. The Manager is elected by a majority vote of all Council members to serve until the first Monday of January of the even-numbered year succeeding his appointment, and until his successor is elected and qualifies. Thereafter, the office is filled biennially. In the case of a vacancy, the Council fills the office and has the right to remove the incumbent at any time by a majority vote of all members.

The Manager is chosen on the basis of his executive and administrative abilities. He must be a regis-



● SURVEYS are still basic for public works. Manager-Engineer uses self-leveling automatic level in laying out streets.

tered professional engineer in the State of Pennsylvania; he need not be a resident of the Borough or of the State at the time of his appointment, but as soon as possible thereafter he must become and, during his tenure as Manager, remain a resident of the Borough. The Manager must be bonded in the amount of \$5,000. Premium for the bond is paid by the Borough. His compensation is fixed from time to time by ordinance.

As chief administrative officer of the Borough, the Manager is responsible to Council for administration of the affairs of the Borough. The

Burgess is authorized to delegate to the Manager, any of his non-legislative and non-judicial powers and duties. The powers and duties of the Manager include supervision of the activities of all municipal departments, except those not delegated to the Manager by the Burgess or by Council. He hires and suspends or discharges all employees under his supervision; but persons covered by the civil service provisions of the Borough Code must be hired, suspended or discharged in accordance with such provisions.

Budget Report Required

He is responsible for preparing and submitting to Council before the close of the fiscal year, a budget for the next fiscal year and an explanatory budget message. In preparing the budget, the Manager obtains from the head of each department, agency, board or officer, estimates of revenues and expenditures and other supporting data. The Manager reviews these estimates and may revise them before submitting the budget to the Council. He is then responsible for the administration of the budget after its adoption by the Council.

Under the direction of the Burgess he executes and enforces the laws of the Commonwealth, and ordinances, resolutions and by-laws of the Borough. In addition to the duties of Manager, he holds the offices of Borough Secretary, Bor-

(Continued on page 182)

LAND USE DEVELOPMENT and the Interstate System

DAVID R. LEVIN

Chief, Highway and Land
Administration Division
Bureau of Public Roads
U. S. Department of Commerce

THE NATIONAL System of Interstate and Defense Highways, and especially the points of interchange of that system with other highways, may soon be to our communities—both urban and rural—what river junctions and railroad division points were to the transportation media of the past. The interchanges logically become the nodes of new developments. It is likely that on the entire Interstate System, the total number of interchanges may reach 14,000 though it is impossible to say exactly.

Each interchange is designed in accordance with established criteria, and each interchange ramp has a given design capacity. The criteria and design capacity are based upon traffic that could reasonably be expected to accumulate as of 1975, and on other factors. In terms of a given interchange, the highway official will assume that certain land use developments will reasonably occur and will design the interchange on that basis. In a number of instances, at least, particularly where other location factors are at a maximum, almost before the pavement is dry on the interchange ramps, several industrial plants, a regional shopping center, a housing center, a complex of motels and restaurants, or other large traffic generators will set themselves down next to the entrance or exit terminal of the interchange, literally at the ends of the ramp. Eventually, the unanticipated additional traffic load which these generators create frequently will cause the ramp to break down functionally because its design capacity has been exceeded.

This situation creates the problem we have today in connection with many of our highway interchanges. It can render ineffective investments of highway funds ranging from \$129,000 to over \$2,000,000 each. It can also mean that additional millions of dollars of private capital can turn out to become bad investments. Here is why.

Private enterprise has an important stake in establishing itself along highways of modern design and doing it in such a manner that the venture capital is not impaired, long

before the physical plant wears out, because of the functional obsolescence of the highway. It is to the advantage of private venture capital, as well as of the public at large, that interchange areas be so designed and land uses in the vicinity be appropriately placed in relation to the access facilities, so that both can serve for years to come. If the public facilities break down physically or functionally,

intelligent means to create order out of what otherwise will be chaos.

Now about timing: One may say, it'll really be another five years or more before the problem gets too acute. Why not wait until then for corrective measures? The answer is simple: If we wait until the problem is upon us, it will be too late. In another five years, the land use development will already have taken place and it will be largely academic



● POSSIBLY a picture of things to come. Urbanization is rapidly engulfing this interchange. Traffic load and often water and waste disposal will become problems.

users stand to lose as heavily as the public, if not more so.

I am not suggesting that we prohibit private land uses in the private areas beyond the interchanges. We are not building the Interstate System for it to become a museum piece; the System is not an end in itself, but a means to an end. It is being designed and built to serve traffic and private land use and private enterprise. In order to serve this end most effectively we must focus, right now, on the most

as to what can be done about it at that time. The time to act is now.

As an aid to possible solutions to the problem of effecting a more orderly arrangement of land uses around highway interchanges, we might consider the four broad types of uses that are customarily attracted to interchange areas.

1) One type, identified as highway-oriented, seeks to cater to the motorist and his vehicle. This includes service stations, restaurants, motels, and related enterprises.

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2) A second type is the large traffic generator that seeks to have easy access, at interchange points, to a ready market for merchandise, to a labor force that is widely dispersed but easily accessible via express highway, or to large numbers of vehicles generally. This includes factories, shopping centers, outdoor theaters, and the like.

3) A third variety might be ordinary community-type enterprises

particular grouping is not important. What is important is that characteristically, certain kinds of land uses are attracted to the interchange points, and that these, almost invariably, are the substantial traffic generators.

Possible Remedies

What can be done to cope with this developing and vexing problem? Unfortunately, there are no pat an-



• **LEGAL** controls and proper design can help regulate private land use to the public interest. Here the residential development is insulated from interchange ramps.

that seek to establish themselves at the points of interchange largely because that is where the community ends or begins. These uses might include individual stores and service establishments.

4) A fourth type includes all other kinds of uses, such as individual residences, that seek only the most elemental type of access, but are attracted because of special circumstances.

Perhaps there are other types of uses or other classifications. The

swers, but we do have some leads. For years, some devices have been developed and used for other or allied purposes. Some offer greater promise in connection with the interchange problem than others. Let us consider these briefly, since we might find that one or more of these, perhaps with a little different twist, could answer the need.

a) **Design Solutions.** It would be ideal, of course, if through the interchange design mechanism itself, we could achieve the type of control we

are seeking. If there is such a design solution, nobody has come forward with it; but some design considerations are pertinent. For instance, more and more highways that lead off of the Interstate interchanges are being designed with median strips. This in itself is helpful for obvious reasons.

b) **Extension of Control of Access.** Another possible solution may be found in an extension of the principle of control of highway access. This feature characterizes the Interstate System itself and its ramps. Some advocate that if control of access is further extended to a reasonable degree beyond the entrance or exit terminal of the ramp, this would be adequate to deal with the problem. Some States already are using this device to a limited extent for this purpose.

One might ask: What is a reasonable extent? Half mile beyond the entrance or exit terminal of the ramp? Three-quarters of a mile? One mile? Or more? Others may ask: Will this really be effective, or are you just pushing the point of potential congestion that much farther down the crossroad and not really assisting the situation materially? The extra length of control of access may provide, under some circumstances at least, the needed length for heavy volumes of traffic to enter the approach road in an orderly manner, and this in itself would be helpful.

c) **Acquisition of Private Areas.** Another solution might be for public authority to buy up at least some of the private areas adjacent to the highway interchange. This would solve the problem all right, but would hardly be the most feasible answer. In the first place, it might be difficult to establish legally that the acquisition of such areas involves a public use or a highway purpose. Secondly, we don't have the financial resources to complete the Interstate System itself, within a reasonable time, let alone spend money for such a collateral purpose.

d) **Acquisition of Easements.** We might consider acquiring limited easements along, let us say, a strip half a mile long and a few feet wide, adjacent to the interchange and its approach roads. This would permit private land uses to develop, largely unhampered beyond this strip. Yet easement control of the strip would enable public authority to exercise desirable control in the public interest.



● TYPICAL interchange area near a freeway in 1954 is shown at left above. At the right is the same area in 1959. Many new industries have located in this interchange area as close to expressway as possible. Each generates considerable traffic.



e) **Expanded Entrance and Exit Control.** A number of States exercise some control over the number and placement of any cut into a State highway to create a private driveway to an adjacent use. In most States, however, very little design or traffic engineering review is made of applications for such private entrances and exits along highways of conventional design. It is conceivable, however, that this device, already authorized in at least 24 States, could be expanded to have it involve an appropriate review by design and traffic engineers in the highway departments. Also, elements might possibly be incorporated into the device so that it would be of substantial help in solving the interchange problem.

f) **Zoning.** If it is possible to strengthen the zoning mechanism, it might be seriously considered as a possible solution to the interchange land use problem. A new type of zone might be created, the interchange zone, and special regulations devised to make it applicable to private land use development and public facilities at the point of interchange.

g) **Subdivision Control.** Subdivision control is another device that may be worth considering. In fact, two States—Wisconsin and Michigan—have utilized a form of subdivision control along State trunk highways that involves a formula which might be very helpful. In Wisconsin, for example, by law, the State highway department has been granted jurisdiction over all subdivisions along State trunk highways, involving five or more parcels. Certain standards are written into the

law. Where there is a city or county planning commission or other local body that has the authority to review subdivision plats, such body retains the power to deal with subdivisions along State trunk highways. But it must comply with the standards set forth in the law. If there is no local unit with jurisdiction, the State highway department is the reviewing body.

Since the law was enacted, the Wisconsin State Highway Department has reviewed thousands of plats, with outstanding and effective results. The formula set forth is excellent; it sets up State-derived standards and requires adherence to these standards. Yet it preserves grass-roots administration of a device that traditionally has been local in character.

Accordingly, would it not be possible for the interchange areas to make use of a similar formula, under which certain standards, highway-oriented, for the arrangement and accessibility of adjacent land uses, would be derived by the State highway department, leaving it to the localities to administer?

h) **Frontage or Other Interior Roads.** We could also consider the desirability of using a system of frontage or service roads parallel to the crossroad that interchanges with the Interstate System at a particular point.

i) **Set-back Control.** Several States make use of the set-back device in connection with the improvement of highways. The set-backs involved are modest, and there is always the question of the extent to which public authority may proceed under this police-power mechanism. This

infirmity aside, the set-back tool merely provides some additional area between the highway and the actual traffic generator. One may wonder whether this really is helpful.

j) **Comprehensive Planning.** Finally, the over-all mechanism of comprehensive planning should be considered. If a thorough job is done in this area, the presumption is that the interchange areas, both public and private, will be adequately protected and provided for. We must realize, however, that comprehensive planning, as we know it today in most urbanized areas, does not necessarily have the full force and effect of constraining public and private development according to its specifications; and that it still depends upon the willingness of the parties at interest to go along.

Maybe none of the several solutions tentatively proposed here will prove to be entirely feasible. That is not necessarily important. But what is of paramount importance is that we recognize that the problem of the highway interchange, in terms of its land use development, is upon us right now, and that we need to do something intelligent about it as soon as possible. The sooner we devise some effective answers, the better we will be able to reconcile the uses of the highway interchange with the uses of the adjacent areas, to the more lasting benefit of both public and private interests.

This article is a slight condensation of a paper presented by Mr. Levin at the 64th Annual Road School at Purdue University.

PEANUT HULLS

as a Mulching Material

WILLIAM F. HALLSTEAD

MULCHING on the recently completed Baltimore-Harrisburg Expressway, U.S. Route 111, landscaping contract cost about one-third less than the usual mulching work in this Middle-Atlantic area. Moreover, the mulch on the big \$73,000 landscaping job was unusual—one of the first large-scale public uses of peanut hulls.

The contract originally called for 2,000 cu. yd. of wood chips. When that could not be readily secured, the landscape contractor—DeKalb Nurseries, Inc., Norristown, Pa.—was authorized by the Maryland State Roads Commission to use peanut shells. The hulls were supplied on a tonnage basis at \$10 per ton f.o.b. Franklin, Virginia, and were shipped packaged in 45 lb. burlap bags.

The scarcity of wood chips, by the way, is becoming more pronounced in the East. In fact, in some states ground chips are soon apt not to be available at all. Pointing up the growing supply difficulty, some Virginia paper mills are transporting chips from more than 200 miles distant and paying the same price for these chips by weight that they pay for pulp wood. An unverified report has it that some saw mills are now making more on wood chips than on regular saw mill operation. With chips in such high-priced demand, they won't be long available as an economical mulch. Peanut hulls, on the other hand, are a readily obtainable by-product that hasn't yet been tried by the vast majority of highway departments.

On the DeKalb contract it was found that one man could easily spread the 5 cu. ft. of peanut hulls in a bag and that the material did not have to be forked or shoveled as does wood chip mulch. The material was spread 4 in. in depth on ground frozen at the time, yet it did not blow off even in a stiff wind. The mulch has been in place through a winter and a wet spring—in some places on steep embankments, yet there is no discernible slipping or blow-off. The broken hulls are very fibrous and form an interlocked mat that holds up not only in wind, but that also resists



• CLOSE-UP view shows the fibrous quality of broken hulls as received from the shipper. The fragments interlock to resist blow-off even in winds of high velocity.



• PEANUT shell mulch in this median planting on Baltimore-Harrisburg Expressway has been in place almost a year. The mulch is normally spread to a 4-in. depth.

wash. Nonetheless, the hulls retain their porosity.

DeKalb's enthusiasm for peanut hulls as a landscaping mulch is reinforced by the City of Norfolk

where the Bureau of Parks and Forestry has expressed surprise that peanut hulls have not as yet been generally accepted as a mulching material. There, peanut hulls are

ranked among the top three mulches along with pine needles and sawdust. Mulches ranked lower by the Bureau include tobacco stems, peat moss, wood chips and leaves.

One of the largest nurseries in the South has been using peanut hulls for many years to mulch herbaceous plants and has found them "very satisfactory in every respect and superior to any other material tried."

Concerning fertilizer value, North Carolina State College has released the following analysis of peanut hulls (among 25 other materials): 22.80 lbs. of nitrogen per ton, 3.40 lbs. of phosphoric acid per ton, and 19.00 lbs. of potash per ton. This study of 26 materials placed peanut hulls right in the middle of the list for nitrogen content; 23rd in phosphoric acid; 18th in potash. Ac-

cording to the analysis, the hulls contain more nitrogen and potash than forest leaves, wheat straw, cow horse, pig and sheep manure, pine straw and corn cobs. Of the foregoing, however, all but wheat straw, pine straw and corn cobs exceed peanut hulls in phosphoric acid content.

This writer's inquiries have brought in only two reservations concerning peanut hull mulch. One nursery reported an occasional infection of nut grass, but not sufficiently widespread to discourage use of the mulch. A North Carolina horticultural society had had no trouble with the hulls carrying weed or grass seed—that group did express, though, the opinion that there was "a possibility that nematode infestation might be spread by their use" but that "fumigation with

methyl bromide should forestall such chance." Other nurseries made no mention of nematode infestation.

Peanut shells do not disintegrate as rapidly as some commonly used mulches such as pine straw, nor do they pack or crust like peat moss. They are lighter in color than many mulches and this has somewhat retarded their popularity for private garden use. For landscape mulching along highways, of course, color has little importance. As for water retention capabilities, DeKalb reported on the Baltimore-Harrisburg Expressway job: "Greater than any medium we have ever used in the landscape business. This includes peat moss, humus, manure, straw and wood chips."

All of which says a lot in favor of this quite neglected mulch, the peanut hull.

LONG RANGE PLANNING FOR A WATER DEPARTMENT

Planners for the Dallas City Water Works have provided very detailed schedules of work to be completed in the next ten years, outlines of improvements from 1970 to 1980, and population estimates, water requirements and possible reservoir sites to 2000.

A paper presented at the 42nd Texas Water and Sewage Works Ass'n. Short School, Texas A&M College, by Robert G. Ford, Ass't. Sup't. (Business) Dallas City Water Works, Dallas, Tex.

THE PLANS the utility operator makes today will determine whether or not he will have the ability to perform economically in the future. Besides his own future and that of his utility, he has the future of the community in his hands as well, for without good water and sewer facilities the community cannot realize its full growth and wealth potential. If his plans for the growth of his utility are inadequate or over-optimistic, the result is added costs over and above what is necessary. And these high costs will perhaps be incurred at a time when the service his plant is giving its customers is at its worst.

In order to avoid this consequence and others not so obvious, the utilities supervisor must have some notion about where he is headed. He must have a plan. The prevention of costly mistakes should receive more of the supervisor's attention than the correction of past errors. He cannot attempt to handle problems only as they become emergencies. He must

be able to prevent emergencies and have a placid working atmosphere. He must decide whether he will work with a planned approach or undergo the problems of explaining away poor and expensive service.

Water and sewer planning must necessarily be long range. From three to seven years are required to plan and build many major plant additions. And, in Texas especially, sources of water are becoming scarce as cities acquire available rights for their needs far into the future. Growing costs of obtaining water and providing for its return to streams mean that cost prevention is the better part of cost reduction. Long range planning is essential to intelligent appraisal of how to obtain needed water sources, processing plant and customer facilities. Plans for 1965 should be well established by now and the water and sewer planner should be considering his 1970 problems. For those who do not plan ahead for at least this period, life will become a continuous sequence of expensive surprises, and cost reduction will be a fight to correct the errors caused by lack of foresight.

It is one thing to recognize the

need for a long range plan. It is quite another thing to compile one. Because the plan is so important and because much of it must necessarily be estimates, planners must use extreme diligence to see that information upon which the plan is based is accurate and complete though the best of plans will contain some errors and omissions. The Dallas plan is the result of many man-years of study and covers, in some parts, the next 40 years. The minimum-period plan (for the next 10 years) covers three broad areas: 1) The size and cost of plant facilities to be used; 2) the cost of operating this plant; and 3) the source of funds for obtaining and operating the plant.

In determining the size and cost of plant, Dallas started with a "Water Requirements Survey, Dallas County, Texas" through the year 2000. This was prepared by the Bureau of Business Research, The University of Texas. It weighs the major economic forces that will be at work during the period of estimate, for these factors will have tremendous effects on the growth of the community. It contains population estimates showing the number of people, the number of commercial establishments (retail stores, banks, office buildings, etc.) and the type and size of industries that are expected to be served by the utility. The water requirement study also

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contains estimates of the consumption of water in terms of total annual requirements, maximum daily requirements and maximum hourly requirements.

Once population forecasts were made, Forrest and Cotton, consulting engineers, prepared estimates of where, within the service area, growth will take place. Then with the knowledge of how many customers to expect, together with their expected use patterns, the consulting engineers devised plans for building a plant to supply the amount of water customers will need when and where they will need it.

How Much Detail?

The question of how much detail should be in a plant master plan depends upon how soon actuality will take place. The Dallas plan is in very great detail through 1970. Through this year the plan states the size, length and locations of mains, both water and sewer, along with their cost. Other plant additions, including impounding reservoirs, treatment plants, booster stations, etc., are also set forth. This portion of the plan includes estimated beginning and completion dates to within a year.

From 1970 through 1980 the plan contains the details of size, location and cost of water facilities only. Only completion dates are stated for these. From 1980 through the year 2000 the plan states in broad terms the population estimates, total water requirements and possible sites for impounding reservoirs.

The 1960-1970 estimates have already been used as a basis for important management decisions. Among those decisions are the present rate structure and future bond programs. Actually, these may be considered as part of the plan itself because they fulfill the third requirement of a long range plan—that of determining the source of funds for obtaining and operating the plant.

With the knowledge of the plant facilities to be operated and the quantities of water to be processed and delivered, waterworks personnel began estimating operating expenses. In the Dallas studies these expenses were put into three broad categories: 1) Expense necessary to administer customer accounts, without regard to production; 2) plant operation and maintenance costs; and 3) water and sewer costs that vary with production.

The cost of administering customer accounts tends to vary some-

what with the number of accounts. These expenses include meter readers, accountants, cashiers, bookkeepers, complaint clerks, etc. These costs, if plotted on a graph where one coordinate is number of customers, describe a stair step. Accounting systems, like plant, have a range within which they can operate without a variation in personnel and/or equipment cost. And within a broader range, adding more work load can be offset by adding more personnel and/or equipment. However, above a certain volume the entire system may have to be changed to accommodate the load. Thus, the stair step can be described as one in which steps become progressively larger. The 10-year plan includes a hard look at the accounting and records systems.

Plant operation and maintenance costs are like customer accounts in some respects. They tend to vary in stair-step fashion as major increments of plant are added. For a number of reasons, the operation of a new plant addition may cost more or less than the operation of a plant increment that is already being operated.

It is obvious that long range planning must take cognizance of the fact that most costs in running a water and sewer utility do not vary directly with the quantity of water furnished the customers. But some costs do vary in this manner to a certain extent. In the Dallas study, electricity and chemicals are treated as variables with allowances for distance, in the case of electricity, and for raw water content in the case of chemicals.

In building the long range plan this far the first two objectives had been reached—at least, momentarily. The size and cost of plant facilities and the cost of operating these facilities have been determined. The next step was planning the financing.

Cash Requirements

Early in the plan the starting and completion dates of plant additions were determined. These, together with the cost of the additions, provide a schedule of cash requirements, year by year, for fixed assets. Because the cost of these additions is not small, there will be a need for some type of borrowing, since our publicly-owned water and sanitary sewer department cannot accumulate sizable surpluses. Borrowing means bonds, and, in any event, bond financing has two advantages over pay-as-you-go financing. First, it spreads cash requirements over

the term of the bonds, leveling the peaks. Second, because it spreads payment over a span of years, it more nearly puts the burden of payment upon those who will use the new facilities. Debt service on bonds plus operating costs give the total cash requirements year by year.

In Dallas the total cash requirements, when plotted against anticipated revenues, showed that considerable cash shortages would be experienced over the period 1960-1970. This was not unexpected news, unwelcome though it was. But the plan had the benefit of showing the magnitude of the shortages. A rate increase was necessary. The cash position forecast showed that an increase large enough to satisfy the needs for 1962 would be enough to cover the entire period. This meant that a series of rate increases was not practical, because 1962 is so close at hand. And it meant also that a smaller rate increase could be required if it were put into effect immediately. With this information plus a detailed plan for plant additions and operating expenses, the necessity of increased rates was demonstrated to the City Council. The Water Department was able, largely through its planning, to avoid what could have been a major financial crisis.

With the long range plan available several cost reducing advantages are apparent:

1) As the plan is being drawn, decisions of when to buy or build plant can be measured against the availability of funds and the use to be made of the assets being acquired. Cost of operating plants or accounting systems can be evaluated.

2) Personnel can be trained or acquired in time to operate the plant as it will exist.

3) Periods of peak cash requirements can be levelled somewhat.

4) A rate can be studied before it is put into effect.

5) Devising such a plan gives the utility supervisor a good insight into the effects of the decisions he will make from time to time.

Plans of this sort are not simple to make. They take much time. And because of the interrelations of the various phases of such plans a certain amount of frustration can be expected. Neither effort nor frustration should prevent the utility operator from having such a plan because the forces which create a need for planning will be at work whether or not he is prepared to cope with them.



NEWS BULLETINS

AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Top Ten Public Works Men-Of-The-Year

Chicago, Ill.—The names of the Top Ten Public Works Men-of-the-Year were officially announced on October 2 by Frederick W. Crane, president of the American Public

sioner, Department of Public Works, Detroit, Mich.; Paul R. Screvane, commissioner, Department of Sanitation, New York, N. Y.; Bertram D. Tallamy, Federal Highway Ad-

formed interest of the people. We must keep constantly informed of the needs and plans of our public works so that we can take intelligent action with respect to them, recognizing their vital importance to the sustained life of America."

The Public Works Men-of-the-



S. S. Baxter



D. L. Erickson



L. D. Knapp



J. A. Lambie



R. W. Morse

Works Association, and general manager of the Buffalo (N. Y.) Sewer Authority. The selections were made by a panel of judges as part of the observance of National Public Works Week, October 2-8. This program, sponsored by the Association in cooperation with Kiwanis International, is designed to create a greater citizen awareness of the importance of public works in the lives of the American people.

Those selected were: Samuel S. Baxter, commissioner and chief engineer, Water Department, Philadelphia, Pa.; David L. Erickson, director, Department of Public Works and Utilities, Lincoln, Neb.; Lloyd D. Knapp, commissioner, Department of Public Works, Milwaukee, Wis.; John A. Lambie, county engineer, Los Angeles County, Cal.; Roy W. Morse, city engineer, Seattle, Wash.; Rear Admiral Eugene J. Peltier, chief, Bureau of Yards and Docks, U. S. Navy, Washington, D. C.; Glenn C. Richards, commis-

ministrator, U. S. Bureau of Public Roads, Washington, D. C.; and Rex M. Whitton, chief engineer, Missouri State Highway Department, Jefferson City, Mo.

In a statement released in support of National Public Works Week, President Dwight D. Eisenhower said:

"It is in the national interest to encourage able and dedicated people to enter the public works field—and to honor those who devote their lives in its service.

"Public works facilities are essential to the health, growth and development of our national community. The successful operation of our business and industry also depends upon carefully planned, soundly constructed and efficiently operated public works. The engineers and administrators engaged in these works are performing a major service for us all.

"Our progress in public works programs depends upon the in-

Year are being honored for their achievements in the field of public works and adherence to the highest standards of professional conduct. Each has received an engraved plaque at an appropriate ceremony in his local community.

Samuel S. Baxter is a graduate of Drexel Institute of Technology and has held various positions with the City of Philadelphia since 1923. He has served as commissioner of its Water Department, with assets of over \$800,000,000, since 1952 and is active in many professional and civic organizations. He was president of the American Public Works Association in 1947 and is currently serving as chairman of the APWA Research Foundation. He is also a national director of the American Society of Civil Engineers and the American Water Works Association.

David L. Erickson, a graduate of the University of Nebraska, has de-

voted over 40 years of service to the City of Lincoln and has played a major role in the planning and development of the public water supply serving that community. He also is responsible for the management of the city's electric utility, street and sewer systems and its building inspection program. Erickson has, likewise, held important offices in various professional organizations.

Lloyd Knapp has been employed by the City of Milwaukee since 1925 and has held various positions in the department including that of superintendent of the Bureau of Sewers and city engineer prior to his appointment as commissioner in 1956. In this latter capacity, he is responsible for the efficient performance of a department employing some 5,000 persons, with an annual operating and construction budget of more than \$65,000,000. Knapp, a graduate of the University of Illinois, is currently serving as

building inspection, and various other types of services to many of the smaller cities within the County. He is active in civic and professional groups and was recently named president of the National Association of County Engineers.

Roy Morse, in addition to serving as city engineer, is chairman of the Board of Public Works which approves plans and lets contracts for a municipal construction program exceeding \$20,000,000 per year. He is a graduate of the University of Washington and served as superintendent of water for the City of Seattle prior to his appointment as city engineer in 1957. Morse, like the others selected for this honor, is active in community affairs and is currently serving on the board of the Seattle Council of Churches.

Rear Admiral **Eugene J. Peltier**, a graduate of Kansas State University, is responsible for the implementation of sound public works

Glenn C. Richards is a past chairman of the National Committee on Urban Transportation which developed a series of authoritative manuals on methods and procedures for providing better transportation in urban communities and is currently serving as chairman of the American Municipal Association's Highway Committee. He is a graduate of the University of Michigan and has been general superintendent and/or commissioner of Detroit's Department of Public Works since 1941.

The 23-year civil service career of **Paul Screvane** has been marked by a steady rise through every rank in the department. He was 42 years of age in 1957 when he was named to his present position, and, thus, became the youngest commissioner in the department's history. He had a somewhat comparable military record with the U. S. Army during World War II, advancing from private to the rank of lieutenant col-



E. J. Peltier



G. C. Richards



P. R. Screvane



B. D. Tallamy



R. M. Whitton

senior vice president of the American Society of Civil Engineers.

County engineer of Los Angeles County, California, **John A. Lambie** is a graduate of the University of Southern California and received a master's degree in the science of civil engineering from that university in 1938. Lambie has been employed by the County for over twenty years and was named to his current position in 1955. In addition to providing public works facilities and services to the residents of the unincorporated areas of the County, his responsibilities include the negotiation and administration of contracts for rendering engineer-

management programs in the Navy Shore Establishment which consists of all types of facilities including 150,000 buildings and other structures, and some 100 active operating airports. About \$500,000,000 is expended each year for the maintenance and operation of such activities. Admiral Peltier also has technical control of the Seabees and is chief of the Civil Engineer Corps of the U. S. Navy. He has held various positions including that of public works officer of the Naval Air Station at Jacksonville, Florida, and of the 14th Naval District at Pearl Harbor, Hawaii, before his assignment as Chief of the Bureau of Yards and Docks in 1957.

onal. Screvane currently directs the job of annually collecting and disposing of some 3,000,000 tons of refuse, sweeping 4,500 miles of paved thoroughfares, and cleaning snow from the city's streets. This requires a working force of 14,000 persons and an annual budget of \$100,000,000.

Federal Highway Administrator **Bertram D. Tallamy** graduated from Rensselaer Polytechnic Institute in 1925 and received an honorary degree of Doctor of Engineering from the Institute in 1957. He is responsible for the administration of the multi-billion dollar federal-aid highway program which includes

OFFICERS: Frederick W. Crane, Buffalo, N. Y., President; Albert G. Wyler, New Orleans, La., Vice President. **REGIONAL DIRECTORS:** (term ending 1961) Louis H. Moehr, Wyandotte, Mich.; John A. Morin, Oakland, Calif.; Roy W. Morse, Seattle, Wash.; (term ending 1962) Paul R. Screvane, New York, N. Y.; Manon P. Phillips, Augusta, Ga.; Edward J. Booth, Bismarck, N. D.; (term ending 1963) George J. Maher, Lewiston, Maine; Robert S. Hopson, Richmond, Va.; Harlan H. Hester, Fort Worth, Texas. **Immediate Past President:** Jean L. Vincenz, San Diego, California. **Executive Director:** Robert D. Bugher.

the construction of the national system of interstate and defense highways. Tallamy was chairman of the New York State Thruway Authority prior to assuming his present position in 1957 and is a past president of the American Association of State Highway Officials. He also held various positions with the New York State Department of Public Works during the period of 1945-1954 including that of superintendent and chief engineer.

Rex Whitton has worked for the Missouri Highway Department since 1920 and has served as its chief en-

gineer since 1951. He is responsible for the location, design, construction and maintenance of a system of highways requiring the annual expenditure of over \$175,000,000. Whitton, a graduate of the University of Missouri, is a past president of the American Association of State Highway Officials and the Highway Research Board and is active in various civic and professional organizations.

The panel of judges selecting the Top Ten Public Works Men-of-the-Year consisted of: Professor Ernest Boyce, chairman, Department of

Civil Engineering, University of Michigan; Ben West, mayor, Nashville, Tenn.; Lawrence Hapgood, director, Program Development, Kiwanis International, Chicago, Ill.; Col. William A. Hardenbergh, editor, PUBLIC WORKS Magazine, Ridgewood, N. J., and Rear Admiral Cushing Phillips, U.S.N. (Ret.), former president, Board of Public Works, Los Angeles, Cal.

The United States Senate has passed a Resolution calling for the observance of National Public Works Week October 2-8, 1960, and governors and mayors likewise have given their support by issuing proclamations. This is the first year for such an observance. Plans include TV showings of a documentary motion picture about the public works field, "Headline for Harper", municipal equipment displays, and open-house at public facilities, special dinners, talks, and other activities at the local level.

New York-New Jersey Chapter Views Hurricane's Aftermath

Asbury Park, N. J.—Despite an unwanted visit by a hurricane earlier in the month, this seaside resort city played host to over 320 members and guests of the New York-New Jersey Chapter for the Fall meeting held on September 30. Meeting Chairman was Kendall H. Lee, Asbury Park's City Manager. While a survey of the storm-damaged beachfront was not a scheduled inspection trip, all public works men in attendance took advantage of this opportunity to see for themselves the extent to which wind and waves had ripped and buckled sections of boardwalk.

Registration was held at the city's Convention Hall, where a wide variety of equipment, materials and displays of municipal service organizations were on exhibit.

A highlight of the afternoon meeting was the presentation to the Chapter of New Jersey Governor Meyner's proclamation observing the week of October 2-8 as Public Works Week. The presentation was made by Raymond F. Male, who is State Commissioner of Labor and also Mayor of Princeton.

Two interesting papers were presented in the technical session. In the first of these, City Manager Lee described the operation of Asbury Park's beachfront property, which is entirely municipally owned. He noted that while damage caused by recent hurricane "Donna" was in excess of \$250,000, this was not nearly so great as losses caused by



SPREAD 5 TO 40' AT A FLICK OF THE FINGER WITH NEW HI-WAY MODEL TG SPREADER!

- Continuously variable dual-hydraulic cab-controls permit driver to instantly regulate width and depth of spread!

Now, with the new design of the HI-WAY Model TG you can choose any spreading width from 5 to 40' merely by touching a fast-acting hydraulic control in the cab. A similar control regulates the flow of all material from sand, salt, chips, cinders and calcium chloride to heavy bank sand containing an occasional 2" stone. This exact control saves time and materials on any job. Waste is further reduced because there is no free-flowing when

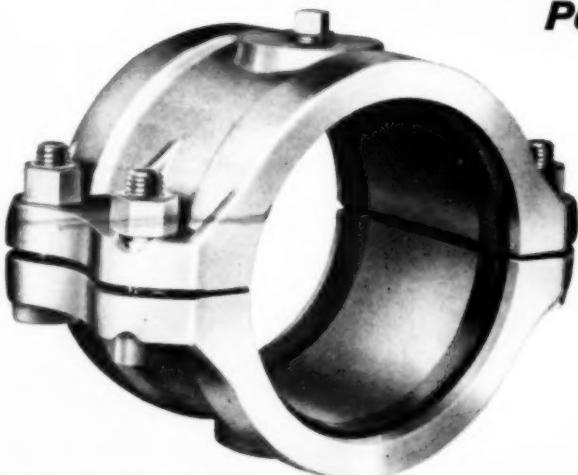
the auger is stopped. A stabilizer bar keeps the spinner level at all times, regardless of dump body angle. Spreader fits any standard dump body 6'6" to 8' wide. The hydraulic drives are powered by low speed, high torque motors. Pump is driven directly off PTO or supply can be taken from the hoist pump. There are no chains, sprockets, gears or mechanical drives to foul up. Means more usable power, fewer parts, minimum maintenance!



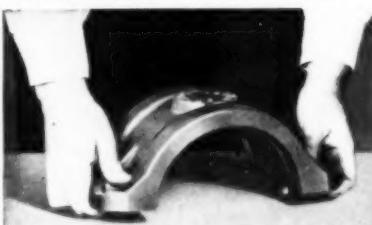
Protect Today's Motorist Through Better Ice Control
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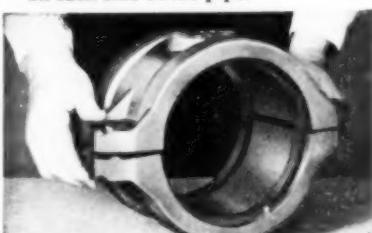
Ductile Iron Split Sleeve



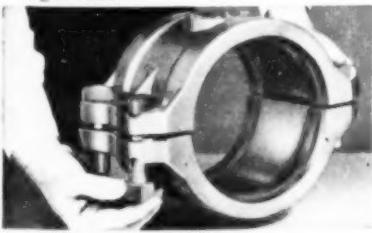
ASSEMBLED IN 3 EASY STEPS



Once the damaged pipe is uncovered, one half of the sleeve is placed on each side of the pipe.



Sleeve halves are drawn together. Pre-assembled rubber gaskets make tight seal.



After the bolts are taken up finger-tight, tightening the four bolts by wrench completes assembly.

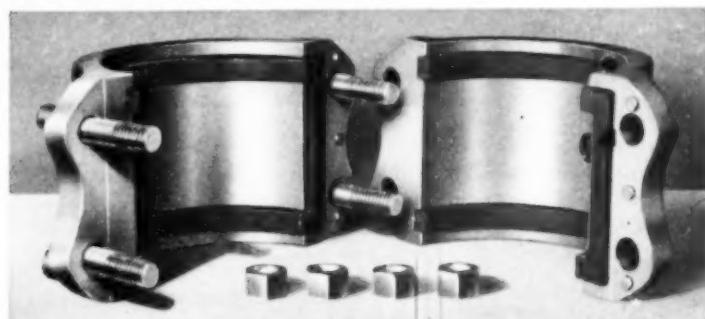
Permits easier, quicker, permanent repair of 4", 6" & 8" transverse cast iron pipe underground breaks

LIGHT WEIGHT Assembled 4" diameter sleeve weighs but 26 lbs. Weight of 6" sleeve is 32 lbs., 38 lbs. for 8" sleeve.

SHORT LENGTH Effective length of 4 inches between end seals on all sizes. Overall length is 6 $\frac{1}{4}$ ".

TWO-PIECE ASSEMBLY No end glands. Side and end gaskets are pre-assembled and cemented in sleeve grooves.

HIGH STRENGTH All parts are high tensile and corrosion-resistant. Sleeve halves are 70,000 psi tensile ductile iron. Nuts and bolts are high strength, corrosion-resistant alloy.



HERE'S ALL THERE IS TO IT! Illustration shows two-piece glandless construction. Side gaskets overlap ends of circumferential gaskets for tight seal. Four bolts are only accessories. Tapping boss on each half allows maximum tap of 2 inches. Regularly furnished with one sleeve-half tapped for $\frac{3}{4}$ " pipe.

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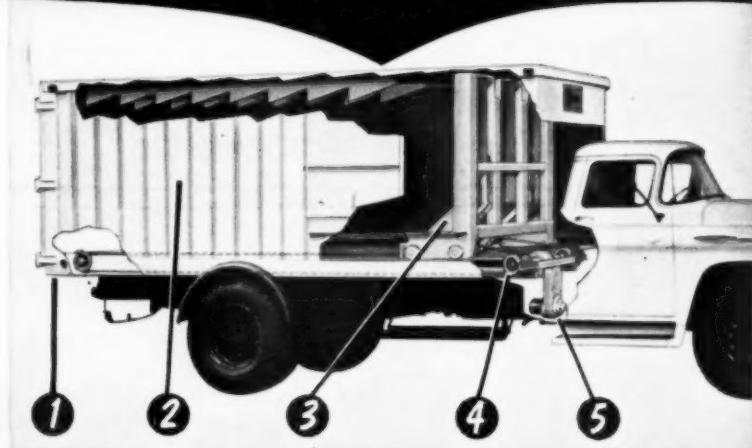
Eddy Valve Company, Waterford, New York
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a
fact...*



PACKER BODIES REQUIRE LESS MAINTENANCE THAN ANY OTHER UNIT...

**\$150 in spare parts cover
90% of any future field repairs!**



Simple Design Spells Low Maintenance Costs

- ① Fast, easy rear door dumping without raising body — no heavy, complicated hydraulic tailgate involved with possible costly repairs.
- ② Square, van-type body design eliminates bulky, dead weight caused by complicated hydraulic systems and heavy tailgates — allows mounting on low-cost, smaller size truck chassis with resultant savings in lower operating and maintenance costs.
- ③ Stabilized, bulldozer-type packer plate travels on four huge rollers running in heavy guides — lets you pack anything without pre-crushing or fear of damage to packing mechanism or plate.
- ④ Powerful cable arrangement uses only two bottom cables, with simple reeving, prolongs cable life. Note absence of fast-wearing, noisy chains.
- ⑤ Fully enclosed drive has powerful, dependable winch coupled with fast electric clutch — provides years of consistent, trouble-free operation.

What a secure feeling to know that just \$150 in spare parts will cover 90% of any trouble you'll ever have with an M-B Packer. What's more — practically all repairs can be handled by your own mechanics or local garage personnel — no need to wait for special factory-trained people to get your unit back on the job.

M-B Packers are on the job *all the time* eliminating customer service gripes — a headache to everyone in the business. Select the size you need: 14 to 24 cu. yd. truck mounted; and the M-B Contain-O-Pack Self-Loading Packer system for "containerized" refuse handling. Let us prove to you that simply designed M-B Packer Bodies cost less to buy, own and operate — see your distributor for a demonstration or write the M-B Corp., New Holstein, Wisc., Dept. PW



QUALITY MUNICIPAL AND INDUSTRIAL EQUIPMENT SINCE 1907

previous storms, due mainly to improved beachfront protection. The second paper, presented by Robert Hardman, Chief of the Bureau of Water Supply and Policy for the State of New Jersey, discussed the matter of drainage and control of water in the state. Scheduled afternoon activities were concluded by an inspection trip through the city's new sewage treatment plant, which is located on the beachfront, partly beneath the boardwalk.

New officers installed at the dinner meeting of the chapter are: President, Arthur T. Brokaw, Borough Engineer, Princeton, N. J.; Vice President, Francis T. Griffin, Village Engineer, Larchmont, N. Y.; and Henry Liebman, Director of Operations, Department of Sanitation, New York City, Board Member. William Holster, City Engineer, Clifton, N. J., becomes senior Board Member and Floyd Wilcox, Supt. of Public Works, Lynbrook, N. Y., is Immediate Past President.

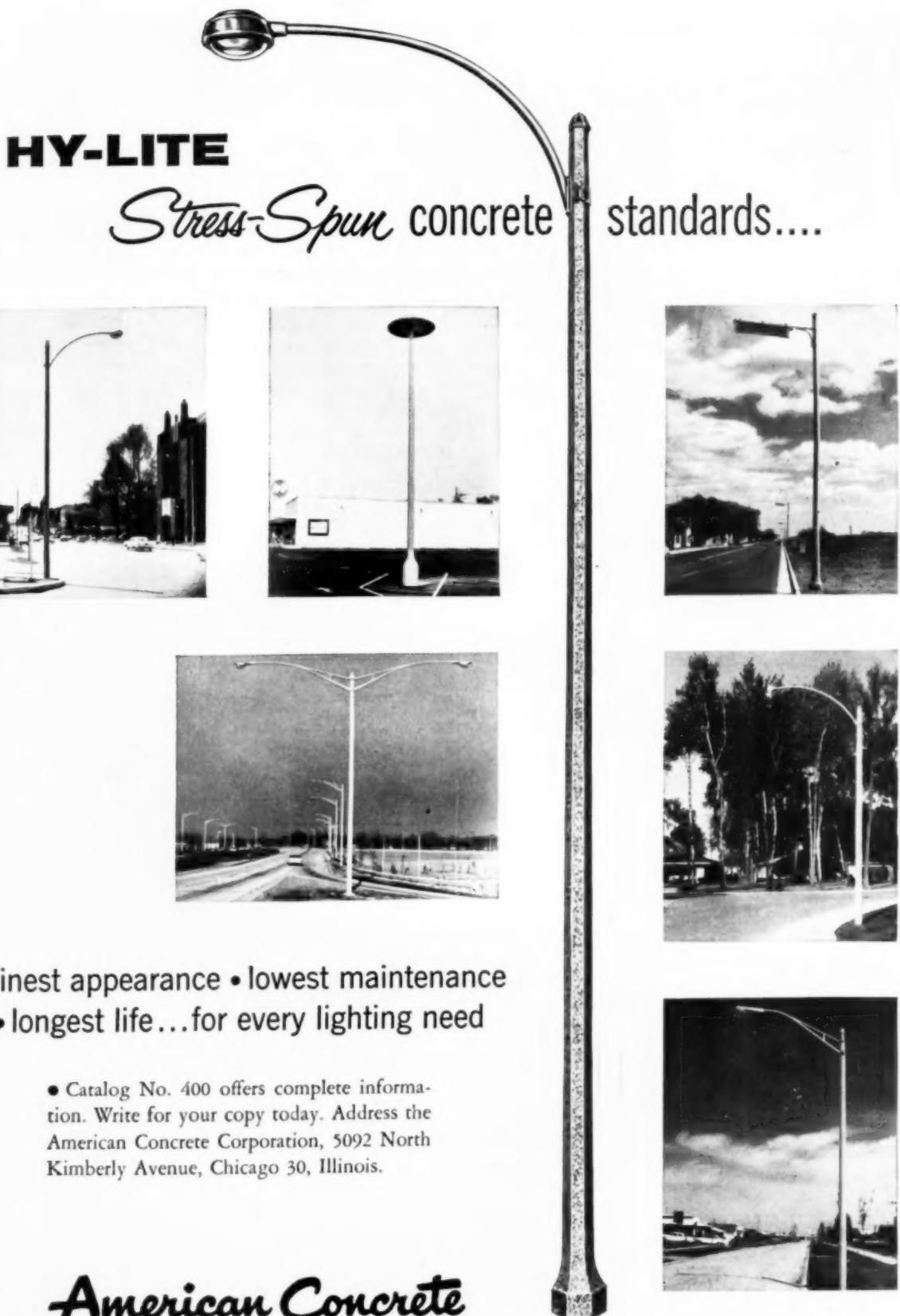
Recipient of the award presented annually to a member who has made an outstanding contribution to the Metropolitan Chapter was Andrew F. Eschenfelder, Borough Engineer of Glen Ridge, N. J., a former president and long-time member of the chapter.

34 Public Works Officials Receive Greeley Award

The following APWA members were named by the Committee on Awards to receive the 1960 Samuel A. Greeley Service Award. Each has had thirty years of service with a single governmental unit.

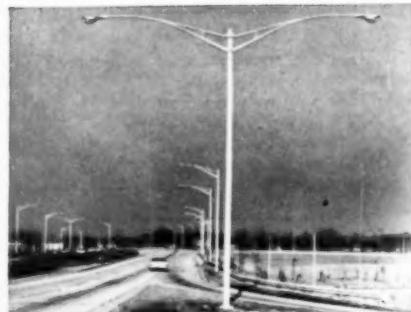
Henry F. Beisner, City Engineer and Director of Public Works, Cedar Falls, Ia.; Louis P. Booz, City Engineer, Perth Amboy, N. J.; Joseph C. Brosseau, Dir. of Public Works, Verdun, Que., Can.; J. P. Burden, City Engineer, San Angelo, Tex.; Stephen E. Butzko, Supt., Roads, Bridges & Drains, Fairfield, Conn.; David Caplan, Dir. of Planning, New York City; Major William F. Casey, City Commissioner, Atlantic City, N. J.; Harold F. Clemmer, Engineer, D. C. Highway Dept., Washington, D. C.; James D. Corcoran, Commissioner of Works, East York, Ont.; Clarence K. Dion, Dir. of Public Works, Westerly, R. I.; John W. Dreyer, Borough Engineer, Staten Island, N. Y.

Ludger Gagnon, City Chief Engr., Que.; Murray Herman, Deputy Director of Engineering, New York City; Justin A. Holden, Supt. of Public Works, Brattleboro, Vt.;
(Continued on page 134)



HY-LITE

Stress-Spun concrete standards....



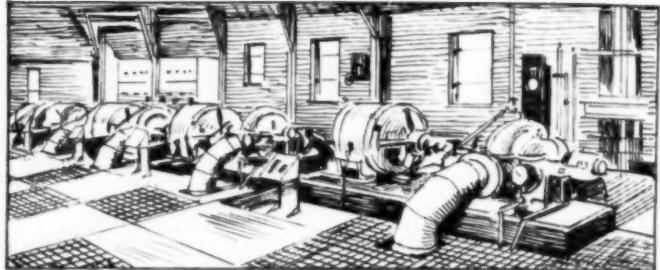
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THE
**WATER
 WORKS
 DIGEST**



Prepared by ALVIN R. JACOBSON, Ph. D.

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

**Endemic
 Cholera**

A theory is presented to explain the long-recognized connection between the incidence of cholera and changing weather conditions in Bengal. The theory is that in hot, dry weather algae in the village water tanks raise the pH of the water so high that the cholera vibrio is favored over other organisms.

The potentialities of these ponds of surface water which serve as the village water supply in spreading infection and the ability of the cholera vibrio to withstand a high pH have been noted.

Results of weekly tests of the pH of six tanks for a 1-year period and observations of the relationship of the pH to weather and to incidence indicate that the pH is a factor to be taken into account. It is suggested that the tanks are the chief means for spread of the vibrio and that the endemic infection is primarily rural rather than urban.

Cholera is endemic in Bengal, the major remaining focus of infection, because of polluted drinking water. The eradication of cholera from Bengal, and therefore from the world, depends largely on the success of the Pakistani and Indian Governments in replacing the village tanks with a source of safe water.

"Epidemiology of Endemic Cholera." By T. A. Cockburn, Johns Hopkins School of Hygiene and Public Health, and J. G. Cassanos. Public Health Reports, Vol. 75, Sept., 1960.

**Three Sources
 of Water Supply**

As a result of consumer complaints and public protest meetings, the Board of Directors of the Baker Metropolitan Water and Sanitation District, located immediately north

of the City of Denver, authorized a water supply and treatment study in January, 1959. Phase "A" was the preparation of a comprehensive engineering report. Phase "B" consisted of a continuing program of investigation of the raw water and treatment results with periodic determinations of the performance of the water treatment plant. Investigation revealed that three water sources were available: that from the City of Denver, surface water from Clear creek which was highly contaminated throughout most of the year, and deep well waters. Under Phase "A" recommendations were submitted in immediate, near term and long range categories. For immediate consideration was the recommendation to drill three additional deep wells to bring the total ground water available to approximately 700 gpm or slightly over 1

mgd and the suggestion for several improvements at the treatment plant, both from the standpoint of operation and construction. Practically all of these recommendations were put into effect during the past year. Several near-term improvements were recommended and are being investigated. The long range recommendations included the suggestion that a program be initiated to obtain additional surface water by combining with other quasi-municipal corporations. Recently the Denver Water Board has changed its policies, enabling the City to enter into negotiations with surrounding municipalities to furnish them with either raw or treated water from its adequate supply of excellent quality. This development will make it feasible for the Baker Metropolitan Water and Sanitation District to enter into a long



Courtesy Chicago Bridge & Iron Co.

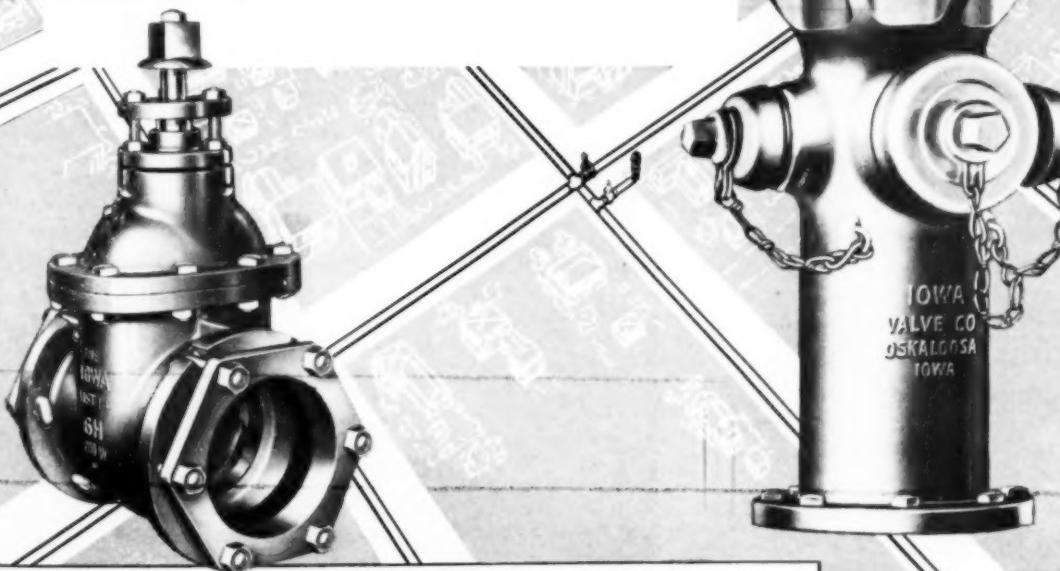
● ELEVATED tank for Rochester, Mich., water supply. The capacity is 750,000 gallons; spheroidal portion of tank is 75½ ft. in diameter; range in head is 25 ft.

Modernize Your Water System with IOWA VALVES and HYDRANTS

New industrial plants, new housing developments, population growth...all put increasing demands on today's water systems. They increase the need for effective control of water distribution...emphasize the importance of reliable, efficient and positive fire protection.

More than ever, it is important to be guided by recommendations of professional engineers, insurance underwriters and experienced waterworks operators; to have the proper spacing of shut-off valves—one at each intersection or at least every 500 feet; have a fire hydrant at every intersection—two at every intersection in business and industrial areas; have a planned maintenance program with regular inspection; weed out costly "orphans" from the system.

Experienced waterworks men are more and more choosing IOWA valves and hydrants for such modernization programs. These are products of proved design, require minimum maintenance and assure long-life, dependable performance. IOWA's long-standing reputation means continued availability of repair parts...permits choice of valves, accessories and specialties from the widest possible range.

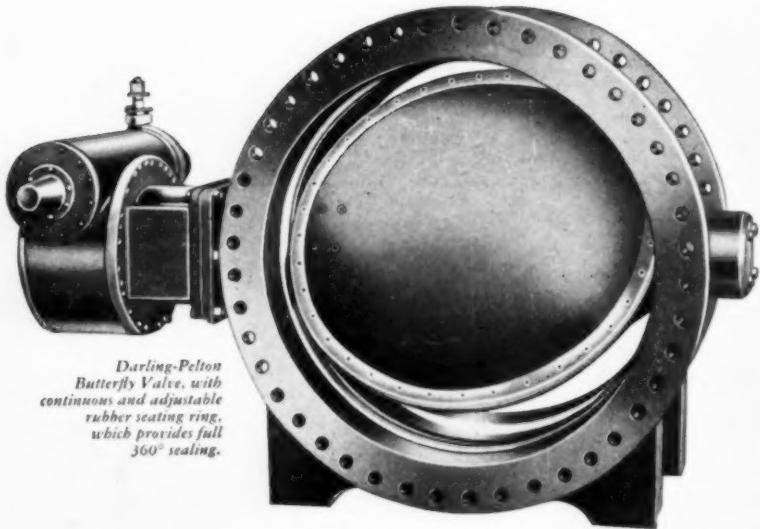


Call in an IOWA man when your plans are taking shape.
His help can save you time and money.

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Darling-Pelton
Butterfly Valve, with
continuous and adjustable
rubber seating ring,
which provides full
360° sealing.

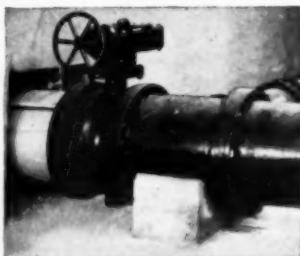
Surer sealing...easier maintenance

with DARLING-PELTON BUTTERFLY VALVES

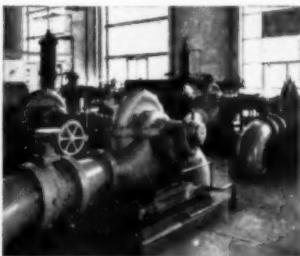
Darling-Pelton Rubber Seated Butterfly Valves are designed to give bubble-tight shut-off, easy operation and trouble-free service throughout the life of the valve. The sealing member is a continuous resilient ring displaced from the operating shaft... and fully adjustable to give bubble-tight closure around the circumference of the disc.

These high-performance valves are designed in accordance with A.W.W.A. specifications...for hydrostatic operating pressures up to 125 psi and velocities up to 16 feet per second. In addition to water service, they have been successfully used on vacuum, gas and chemical service.

To get all the facts, write us for Bulletin No. 5904.



Close-up view of installation in large municipal water plant.



View of Darling-Pelton Butterfly Valves installed in Pittsburgh's new filtration plant.



DARLING VALVE & MANUFACTURING CO.

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Manufactured in Canada by
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term agreement with the City of Denver if engineering studies indicate this to be the most satisfactory from an economic and engineering viewpoint.

"Water District Has Three Sources of Supply—But One Is Awful! Gene A. Claussen, Head, Utilities Section, Ken R. White, Consulting Engineers, Inc., Denver, Colorado. — PUBLIC WORKS, October, 1960.

Potomac River Filtration Plant

To meet the water needs of the enormous population growth within the 427-square mile area now served by the Washington Suburban Sanitary Commission a \$29 million construction program has been undertaken. The first stage of this program includes a new 30 mgd water filtration plant that can be quadrupled in size as demand increases, two major pipelines and other equipment. This new construction includes intakes and pumping installations, a 60-in. concrete pipe force main, a 6 mg finished water reservoir and 36-in. and 48-in. mains leading to the local distribution facilities. This will mark the first time the Washington Suburban Sanitation Commission has tapped the Potomac River for water, although this river is the principal water supply for Washington, D. C., Rockville, Md., Alexandria, Va., and other communities. Problems encountered during construction were primarily due to the considerable rock work necessary, the existence of the old C & O canal which had to be preserved as a historical object, and the fact that the plant was located in a high class residential neighborhood to which the buildings had to conform.

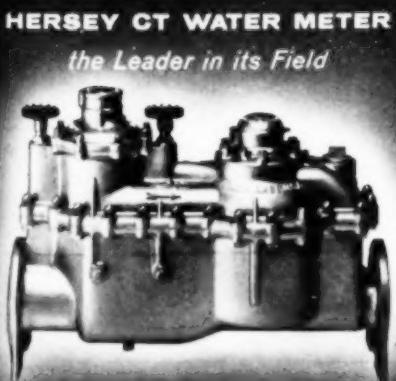
"Potomac River Filtration Plant." By E. E. Halmos, Jr. Water & Sewage Works, September, 1960.

Automatic Chlorine Residual Control

An adequate chlorine residual throughout the distribution system was recognized as of considerable significance as far back as 1908. Recent discoveries have indicated that not only the amount but the type of residual present (free available or combined available) is of even greater importance and must be determined to achieve maximum bactericidal results. To meet these requirements of amount, type and persistence, chlorination must be carefully controlled. Manual, semi-automatic and automatic methods of control have been developed for

HERSEY

How to Check a Water Meter without Interrupting Service



4" size shown above

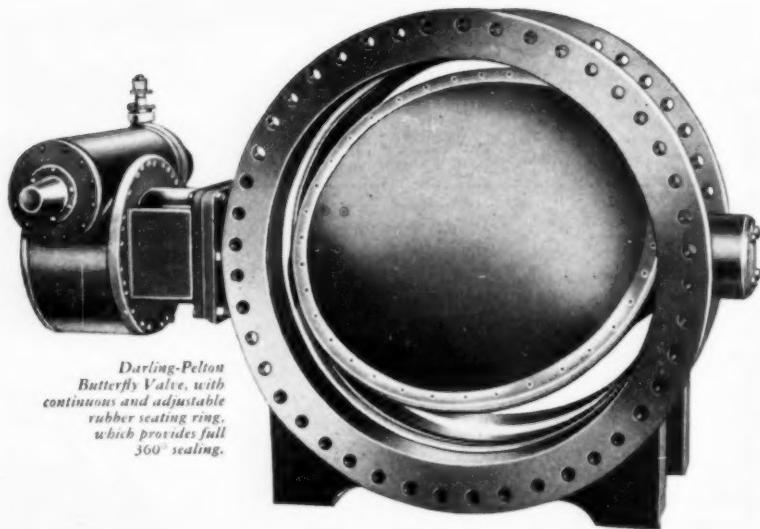
Branches: Atlanta, Boston, Chicago, Cleveland, Dallas, Denver, Kansas City, Mo., Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle.

That's a Hersey Compound Water Meter having its by-pass meter checked *without shutting off the main line*. This is one reason these meters are the No. 1 choice when both large and small rates of flow are to be measured. Another reason is the high degree of accuracy obtained by using the extremely sensitive Hersey conical disc type meter on the by-pass.

A special feature of the Hersey Compound Meter is the exclusive swing type lever valve which diverts small flows through the by-pass but, when opened by a large demand, offers no resistance to the flow of water.

These meters are available in sizes from 2" to 10" inclusive (2", 3", 4", 6" all bronze cases—8" and 10" galvanized iron cases). Write for more facts.

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Darling-Pelton
Butterfly Valve, with
continuous and adjustable
rubber seating ring,
which provides full
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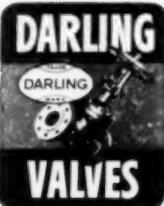
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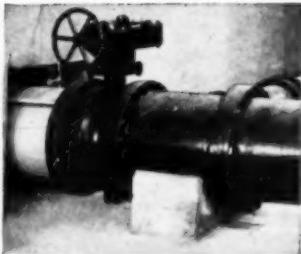
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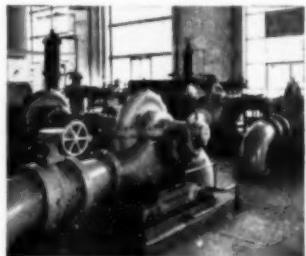
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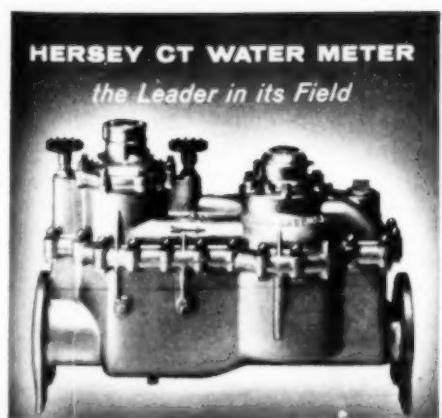
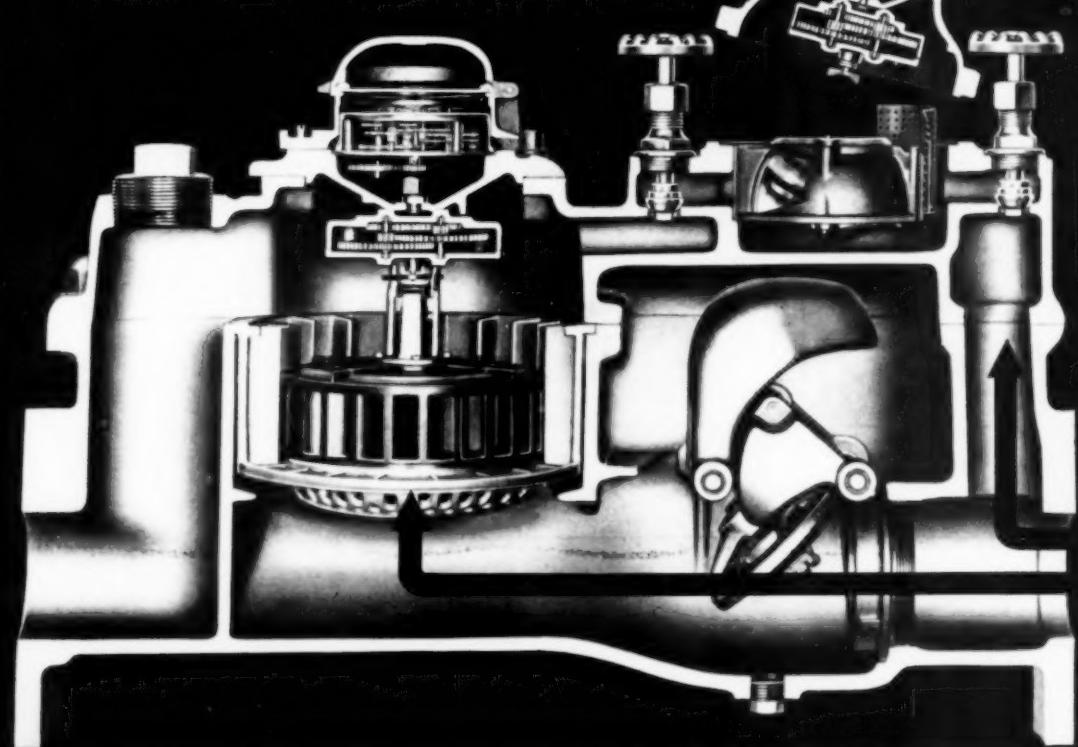
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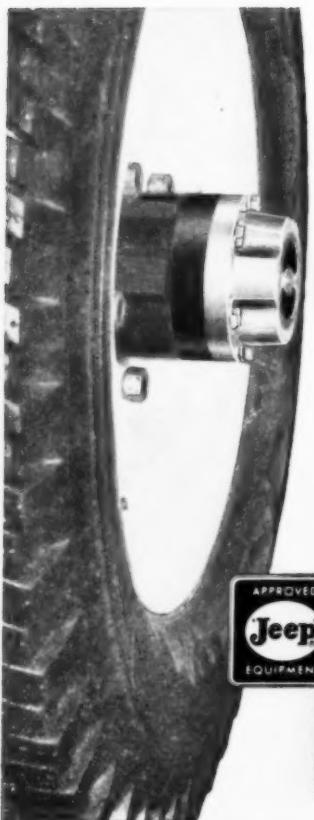
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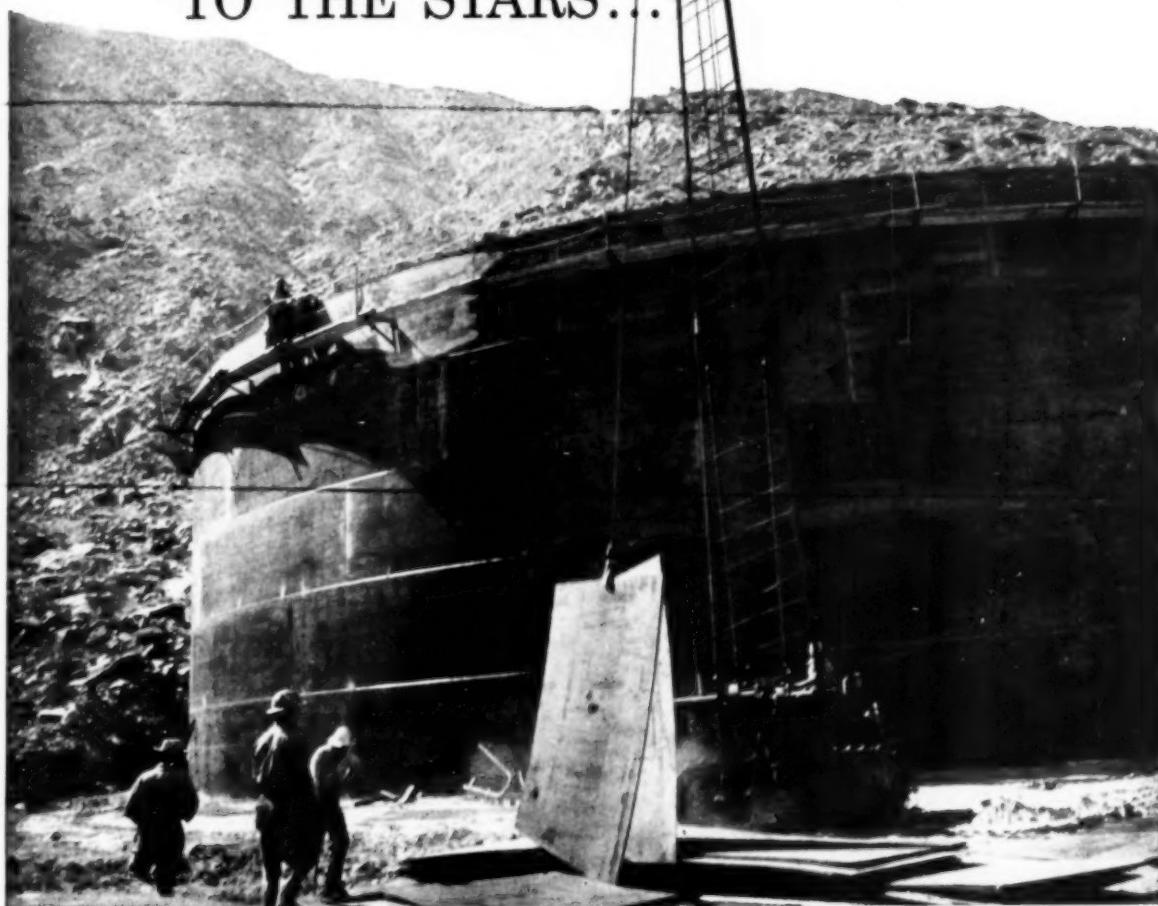
maintaining adequate residuals. To overcome the shortcomings of the other methods the amperometric system of automatic control was developed. It has the advantage of being able to compensate automatically for changes in chlorine demand, to record either the total amount of residual chlorine present or the free available portion present; and is not subject to the interferences that plague the orthotolidin method. This automatic system will help solve the manpower situation and will make it possible for the person in charge of the system to know at all times the amount of residual chlorine throughout the entire water treatment and distribution system.

"Automatic Control of Residual Chlorine." By Attmore E. Griffin. Staff Consultant, Equipment Division, Wallace & Tiernan, Inc., Newark, N.J. PUBLIC WORKS, October, 1960.

Los Angeles Collapsible Dam

Recently the Los Angeles Department of Water and Power built a collapsible dam—a giant nylon bag coated with neoprene 30 ft. in circumference and 150 ft. long—across the Los Angeles River. This unique dam serves the requirements of the Water Department by backing up water in the river so as to replenish underground basins and meets the requirements of the U. S. Army Corps of Engineers and the County Flood Control District by being easily deflatable to pass flood flows. The neoprene and nylon fabric tube is inflated with water from a pipe connection through the channel wall in a period of about 25 min. A siphon arrangement deflates the dam automatically when the water rises to a predetermined height. The dam is completely deflated in a period of ten minutes and the fabric remains flat on the river bottom, permitting all debris to be carried over it by the water. When the storm waters subside, the dam is inflated again with water from a storage tank. To make the replenishment of the underground basins more effective the Department has constructed a treatment plant about 2½ miles above the dam where a coagulant, called Separan 2610, is added to the river water. This organic-polymer causes the colloidal materials to settle out in the river instead of on the spreading grounds, making it possible to treat storm waters winter and summer. The construction of the collapsible dam and the treatment plant permits the

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Palm Springs is a thirsty city. In this desert playground of movie stars and sun-worshippers at the foot of water-rich Mt. San Jacinto are more gardens and swimming pools per capita than any other place in the world. Within the mountain are many underground streams. The problem was to tap the resources and store more water than existing reservoirs would hold. The answer—a 5,000,000 gallon tank fabricated in General American's shops, trucked to a hard-to-reach spot on the hillside and erected by a General American field crew.

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spreading of waters onto the groundwater replenishment areas throughout the year.

"Collapsible Dam Aids Los Angeles Water Supply." By Norman M. Imbertson, Engineer in Charge, Water Plant Operating Division, Department of Water and Power, Los Angeles, Calif. *Civil Engineering*, September, 1960.

Submersible Pumps

Increased interest is being shown by various communities in the use of submersible pumps when they have to turn to wells of greater depth for their water supplies. Important factors to be considered in choosing between submersible and line shaft pumps are fixed cost, operating cost, reliability, ease of maintenance and quietness of operation, especially if the well is located in a residential area. The City of Lansing, Mich., with a population of approximately 130,000, obtains all of its water from 106 deep wells, six being equipped with submersible pumps. Based on their experience, it would appear that the line shaft pump is the better selection from an economic standpoint in capacities of 500 gpm and higher, and also at lower capacities (200 gpm) at settings less than 400 ft. deep. At deeper settings the submersible pump would be the better selection if the pump would be operated for at least 4,000 hrs annually. Maintenance costs generally increase quite rapidly with increased depth for the line shaft pump but maintenance figures are not available for the submersible pumps because they were not installed until 1952. The author states that there is a place for both types of pumps; the line shaft pump being preferred at shallow settings while the submersible pump makes its best showing at the deeper settings.

"Submersible Water Pumps." By Claud R. Erickson, Mech. Engr., Board of Water and Elec. Comrs., Lansing, Mich., *Journal A.W.W.A.*, September, 1960.

Meters Cleaned With Wet Abrasive

The Cincinnati Water Department has for the past year used wet abrasive cleaning equipment to clean its water meters, thereby replacing the conventional use of strong chemicals, acids and alkalies for this purpose. One large machine, with dual work stations for cleaning the outside of meters, handles meters from the smallest up to the

6-inch size. There is also a small machine for cleaning the delicate interior meter parts. A special mixture of abrasive and water is used together with compressed air to clean the meters. Since June, 1959 over 10,000 meters have been cleaned and overhauled, an average of 90 meters per day by two men, at an average direct cost of about 21¢ each.

"Cincinnati Cleans Water Meters By Blasting With Wet Abrasive." By William Sahnd, Supt. of Water Distribution, Cincinnati, Ohio. *Water Works Engineering*, September, 1960.

Corrosion Prevention

The addition of sodium silicate to domestic, commercial, and industrial water systems under controlled conditions, has reduced corrosion, prevented rusty waters, maintained satisfactory flow rates and minimized failure due to pitting and to clogging by corrosion products. Several comparative studies have been cited by the authors that reveal the effectiveness of the silicate treatment for extending pipe life and reducing maintenance costs in both hot and cold water lines. More than 400 large buildings have been treated continuously for more than 10 years and about 50 have been treated continuously for more than 25 years by the firm which the authors represent.

"Sodium Silicate—To Keep Piping Young." By Henry L. Shuldener and Sidney Sussman. Water Service Laboratories, New York, N.Y. *Water Works Engineering*, September, 1960.

Other Articles

"New Life For Old Filtration Plant." The addition of automatic control and feeding equipment, and establishment of a master control panel doubles capacity of old filter plant. By Kenneth F. Knowlton, Supt.—Chemist, Salem and Beverly Water Supply Board, Beverly, Mass. *Water & Sewage Works*, September, 1960.

"Fluoride Adsorption and Resorption Phenomenon of Sodium Aluminum Silicate Zeolites." Part I. Careful investigation has shown fluoride loading and unloading during cation exchange cycles of domestic softening cycles. Part II will include mechanism of adsorption and synthetic activation studies. By R. L. Morris and Josephine Cerny, respectively, Ass't. Dir. and Chief Chemist, and Associate Chemist, State Hygienic Laboratory, Iowa City, Iowa and D. W. Ebert, Assoc. Chemist, State Hygienic Laboratory, Des Moines Branch, Des Moines, Iowa. *Water & Sewage Works*, Sept., 1960.

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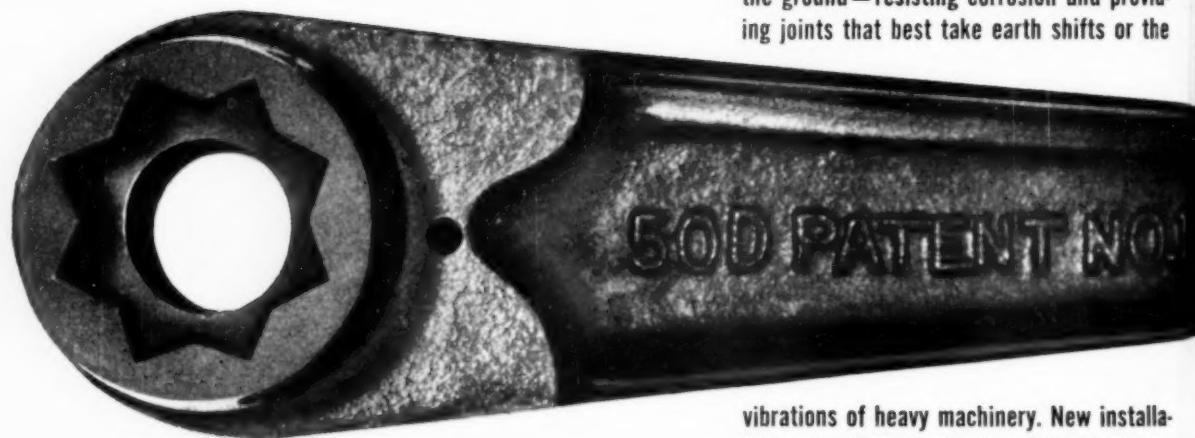


PUBLIC WORKS for November, 1960

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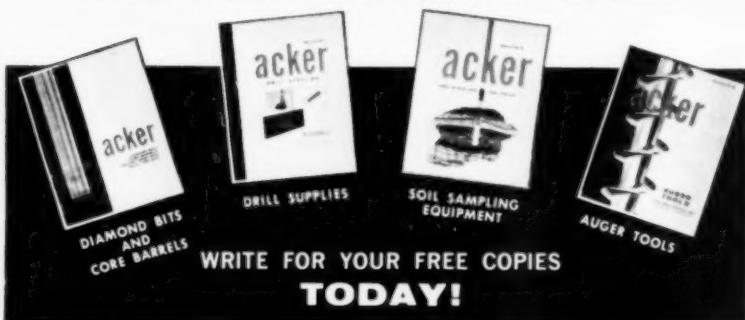


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Greeley Award Winners (Continued from page 122)

Ambrose A. Igo, Supt. of Highways, Quincy, Mass.; Theodore F. Johnson, Comr. of Public Works, Rockford, Ill.; Frank W. Kauffman, Supt. of Sewers, East Orange, N. J.; John L. Kergel, Senior Highway Engr., State of California; Ralph D. Kinsey, Asst. District Engr., State of California; Fred S. Lohman, Chief Deputy City Engineer, Los Angeles; Pasquale Martelli, Town Engineer, West Hartford, Conn.; William T. McGill, Asst. City Engineer, Englewood, N. J.

Alton Lee McWhorter, City Engineer, Birmingham, Ala.; Ed F. Mucke'roy, Supt. of Sanitation, El Paso, Tex.; J. Eldon Rucker, Asst. Dir. of Public Works, Lynchburg, Va.; George M. Shepard, Street & Highway Engrg. Coordinator, Dept. of Public Works, St. Paul, Minn.; Russell Shifley, Supt. Streets & Sewers, Owensboro, Ky.; Ralph C. Taylor, Supt. of Waste Collection Div., Cincinnati, Ohio; L. H. Templeton, Supt., Chattanooga, Tenn.; Walter B. Thompson, Supt. of Public Works, Haverford, Pa.; Ralph Tocchini, Waste Disposal Supt., Fresno, Calif.; Leland A. Webster, Street Commissioner, Warren, Pa.; Arthur G. Welin, Public Works Design Engr., St. Paul, Minn.; and Harry S. Wilson, Asst. Civil Engineer, Staten Island, New York.

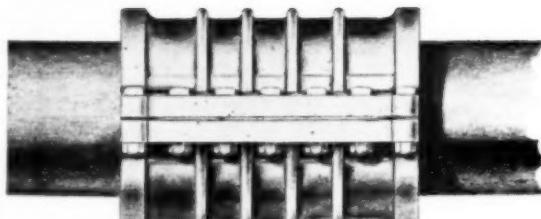
The Harry E. Jordan Scholarship Award

Rules for the Harry E. Jordan Scholarship Award of \$1,500 annually have been announced by the American Water Works Association. The education aid fund established by the Water and Sewage Works Manufacturers Association is to be used to aid students who indicate an interest in entering the professions concerned with public water supply. Applicants are expected to major in scientific or management courses appropriate to those professions. For 1960-61, applications will be considered from persons attending accredited colleges or living in New England, New York, New Jersey, Pennsylvania, New Brunswick, Newfoundland, Nova Scotia, Ontario and Quebec. Consideration will be given to marital status, number of dependents and financial resources of candidates. Applications and further information may be obtained from the AWWA, 2 Park Avenue, New York 16, New York. The deadline for applying for scholarships is February 10, 1961.

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Bell (Hub) End
Repair Sleeve

manently repairing and quickly returning broken and cracked piping to service. Two types of Smith Repair Sleeves are available for installation on standard classes of cast iron pipe. Smith Mechanical Joint Repair Sleeves are produced in sizes 4" thru 12"; Smith Bell (Hub) End in sizes 4" thru 48". Unskilled labor can speedily install Smith Mechanical Joint Repair Sleeves even in wet excavations. Bell End Repair Sleeves are most frequently installed with caulked lead joints. Smith Repair Sleeves reinforce the broken — cracked pipe and their service life equals the life of the pipe.

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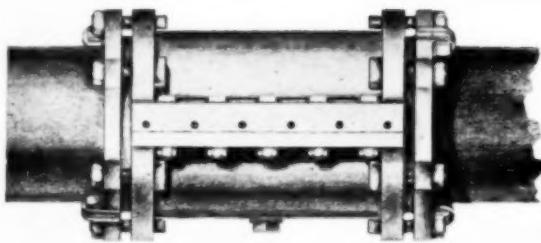
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Scholarship Award

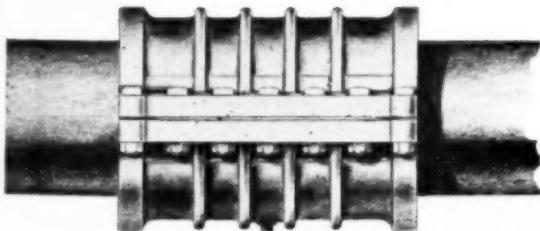
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Mechanical Joint
Repair Sleeve



Bell (Hub) End
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Smith Repair Sleeves are the answer to permanently repairing and quickly returning broken and cracked piping to service. Two types of Smith Repair Sleeves are available for installation on standard classes of cast iron pipe. Smith Mechanical Joint Repair Sleeves are produced in sizes 4" thru 12"; Smith Bell (Hub) End in sizes 4" thru 48". Unskilled labor can speedily install Smith Mechanical Joint Repair Sleeves even in wet excavations. Bell End Repair Sleeves are most frequently installed with caulked lead joints. Smith Repair Sleeves reinforce the broken — cracked pipe and their service life equals the life of the pipe.

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THE A.P. SMITH MFG. CO.
EAST ORANGE, NEW JERSEY

LETTERS TO THE EDITOR

DAN OKUN
REPORTS

We have just returned from a most enjoyable four-week tour of Britain, including visits to several universities and sewage treatment works, not to mention visits to the Lake District and the Edinburgh Festival.

My office at the Technological University in Delft is in the headquarters of the International Course for Hydraulics, which has been running annually for four years, and the new European Course for Sanitary Engineers. This year there are to be 50 engineers enrolled in Hydraulics from all over the world, with quite a few from the United States, and 20 engineers in the Sanitary Engineering program. I met some of the Americans in last year's course, and they were very much impressed with the quality of the course. The students themselves are all very mature.

The main library of the University receives Public Works, but I feel it would be very fine to have Public Works in the reading room of the International Courses, which is used constantly. The library is used primarily for reference, and is a considerable distance from here. It would also be helpful to have copies of the Water Works and the Sewerage Manuals. If you agree, these should be sent to: International Course, Technological University, Oude Delft 95, Delft, Netherlands. It would be nice to have the subscription begin with the July issue.

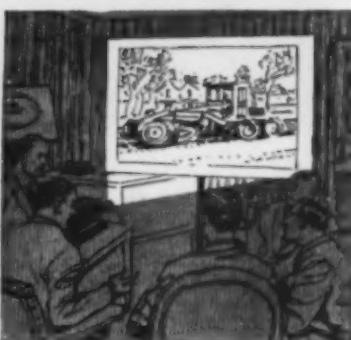
Incidentally, Bob Logan of Dorr-Oliver lives in The Hague very near us and we see a lot of each other. He is in charge of research in Europe, and his main job is to investigate and evaluate new ideas being developed here for possible adoption by Dorr-Oliver. Also, Milton Spiegel is coming over about the end of October on much the same sort of thing. He plans to spend about three days with me. He has had others of Chicago Pump over, and also sent Jim Blodgett for a tour.

There are many interesting things in the water and sewage field in Britain and Europe. To what extent would you be interested in practice here?

Am going to Madrid early in October to attend the 7th European Seminar for Sanitary Engineers, where I will present two papers, one on research and one on stabilization basins.

Charley Weiss' paper in the August issue came out well, I thought.

Daniel A. Okun
Delft
The Netherlands



FILMS

in Brief

Listed below are motion picture films of current interest to engineers, administrators and supervisors in the public works field. The companies providing these films have indicated that the films are available for appropriate use by PUBLIC WORKS readers. Requests for films should be made direct to the company listed with the film.

"The Membrane Filter." A film-strip and booklet explaining the use of membrane filter techniques in the bacteriological analysis of water. Division of Water Supply and Pollution Control, Public Health Service, U. S. Department of Health, Education, and Welfare, Washington 25, D. C.

"Pure Water and Public Health." A typical American community recognizes the importance of its water supply. Includes the sources of water and treatment processes used to maintain public health. (28 min., color, sound, 16 mm.) Cast Iron Pipe Research Association in care of local branch of Modern Talking Picture Service, Inc., 3 East 54th St., New York 22, N. Y.

"Operations Stopwatch." Comprehensive time and motion study showing side-by-side comparisons of all leading makes of crawler tractors. (33 min., color, sound.) Films-Photography Section, J. I. Case Company, Racine, Wisconsin.

"Passenger Conveyors for the Modern Community." Dramatic story of the development of the revolutionary idea of passenger conveyor belt system. (12 min., black & white, sound, 16 mm.) Audio-Visual Department, The Goodyear Tire & Rubber Company, Akron 16, Ohio.

"Soil-Cement Shoulders for Modern Highways." Practices in various parts of the country, both on the Interstate System and Primary highways. Also covers modernization project on existing highway. (10 min., color, sound, 16 mm.) District office of Portland Cement Association, 33 West Grand Avenue, Chicago 10, Illinois.

"Highway Ice Control." A brand new film showing current methods used by practicing maintenance engineers in snow and ice control. Features bulk handling and applica-



tion of calcium chloride — sodium chloride mixtures with excellent action shots of winter operations. (12 min., color, sound, 16 mm.) Highway and Construction Materials Department, The Dow Chemical Company, Midland, Michigan.

"Made to Measure." Illustrating the silent, faithful servant — the water meter. (30 min., color, sound, 16 mm.) Rockwell Manufacturing Company, 401 N. Lexington Avenue, Pittsburgh 8, Pa.

"The Open Road." The many uses of steel in modern highway construction. (32 min., color, sound, 16 mm.) Bethlehem Steel Company in care of local branch of Modern Talking Picture Service, 21 West 60th Street, New York 23, N. Y.



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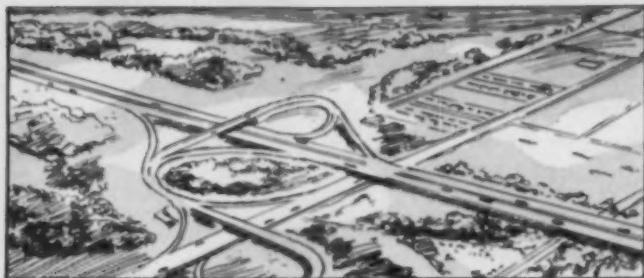
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THE
HIGHWAY
AND
AIRPORT
DIGEST



Prepared by L. G. BYRD, Associate Editor

**End-Result
Specifications**

Historically, highway engineers have written specifications spelling out in minute detail the materials, equipment and procedures acceptable for the construction of a highway facility. Because this inflexible type of specification has proven costly in failing to permit use of new or improved equipment and construction practices, many highway departments are now adopting new specifications based on end results. End-result specifications have limitations which must be recognized, however, if suitable control is to be obtained. Acceptable materials for use in the work must be stipulated; protection of the work during and after construction should be defined. If an end-result specification is used, care must be taken in defining inspection and testing procedures. Tests must be of a type that affords minimum interference with the work progress and that informs the contractor promptly of acceptability of the work. End-result specifications that clearly stipulate materials, inspection and tests, produce cost and time savings when the ingenuity of the contractor and the latest development in materials and equipment are accommodated.

"If It All Comes Out in the End." R. E. Livingston, Planning and Research Engineer, Colorado Department of Highways. *American Road Builder*, September, 1960.

**Maintenance On
Interstate Highways**

While public attention has been directed to the monumental task of financing, designing and building the Interstate System, of equal importance are the problems of maintaining this complex system with wide rights-of-way, multiple traffic lanes, generous medians, complex interchanges, numerous structures and involved lighting and signing re-

quirements. An analysis of maintenance costs on California highways—not including snow and slide removal—showed a wide variation in the percentage of the maintenance dollar assigned to the various components of the old two-lane highway as compared to the modern, multilane highway. Where 69.1 percent of the maintenance dollar for two-

lane highways is expended on the travelway, the major portion (46.6 to 62.0 percent) of the multilane highway expense goes for roadside maintenance. Sign maintenance shows a significant increase on the multilane expressway. Lighting costs, almost non-existent on the two-lane highway represent 4.8 percent of the rural multilane mainte-

Interstate Project Ahead of Schedule

WITH OVER 25 percent of the work complete, the record-breaking \$3,694,174 Interstate Freeway contract over Golconda summit is progressing well ahead of schedule according to an announcement by Governor Sawyer of the Nevada State Highway Board.

To date about 500,000 cubic yards of material have been excavated in preparing the roadbed for the four-lane, controlled access highway which will require removal of 1,-

850,000 cubic yards of earth before its completion in the fall of 1961. The 12.7 mile project awarded to Silver State Construction of Fallon in May of this year is part of Interstate 80 (U.S. 40).

In addition to its record cost and size, the job includes the longest stretch of Interstate to be awarded in one contract. By 1962 with the inclusion of the current project, Nevada's completed Freeway system will total seventy miles.





New Tractor Shovel brings new economies to small town

Michigan introduces Model 55A, early purchaser reports it does many jobs previously skipped (or handled by \$10/hr. rental units)

Like many small communities, the Village of Pewaukee, Wisconsin, for years handled loading and clean-up chores with a farm-type tractor and various pieces of rental equipment. As may be expected, costs were high. But so too, reasoned the Village Board, would be the initial expense of buying a bigger machine . . . especially to a town of only 2000 people.

Then last spring, Aring Equipment Co., Michigan Distributor in Milwaukee, showed the new Michigan 1 yard Model 55A. Price, with trade-in, under \$10,000. Back-hoe, snow plow, sweeper, a lot of other attachments could be added later.

Everyone was impressed. It was easy to figure how this unit's four-wheel-drive, speed and versatility could cut expenses. Also, how it might handle the many jobs previously not done at all or, at best, done inefficiently.

"Since then," says Gary Boyce, Pewaukee Supt of Public Works, "we've used our Michigan for everything." For instance . . .

Saves \$50 weekly rental at the sanitary landfill. The Village makes a monthly pick-up; between times, villagers dump their own trash and rubbish. Once a week, a rented crawler would clean up; between times the dump was messy. Now, the Michigan, with 26 mph mobility, runs out every day or two. Clean-up is done quickly, the old \$10 per hour crawler rental expense is eliminated.



Cleans lakefront. Located on a popular resort lake, Pewaukee has the problem of keeping its beach clean. Lake residents and motor boats cut weeds. Prevailing winds blow them to shore . . . sometimes piling them a foot thick. Previously, each cleanup took 15 man hours . . . "hand hours" since the farm tractor couldn't work in sand. Now, the Michigan wades in hub-deep, shoves weeds onto shore, loads them in truck. In one hour the job's done.

Stockpile-loads sand, salt, blacktop, stone. The power steer, power-shift Model 55A with 1 yd bucket heaps a 3 yd truck in five passes, 2 to 2½ minutes. Pewaukee's old farm-type loader took 5 to 7 minutes for the same job . . . if the material wasn't frozen.



Takes place of truck. When trucks are busy, the Michigan may

carry its own load a block or a mile or more. Street patching is a good example. Here, the 26 mph Model 55A carries a yard of blacktop down the street — stops at potholes—operator or helper hand-shovels and packs in materials as needed.



Tree trimming. Due to inadequate equipment, this once was a chore rarely attempted. Now, the Michigan, used as a fast-moving lift-truck, raises a man up to 8 feet off the ground for trimming with chain saw or 18 foot pruner. Thus street lights have been made more efficient . . . traffic hazards removed.

These are but a few of the jobs where the 66½ hp Model 55A is saving time, trouble, and money for the Village of Pewaukee. Let us show you, first-hand, how it can do the same for you!

Michigan is a registered trademark of
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Construction Machinery Division

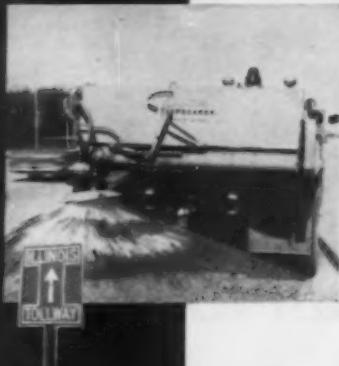
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WHOEVER... The User—Government or Private

WHEREVER... The Job—Town or Country



Flink HDWS4 Completely Hydraulic Tailgate Spreader—A fleet of these efficient rigs help keep traffic rolling on the Illinois Tollway! Left-rear spinner permits easy 2-3 lane spreads in one pass; saves material. Hydraulically operated, cab-controlled, 2-speed auger permits instant change from abrasives to straight rock salt. Volume controlled by hydraulically operated feedgate.



Flink LMC Hopper Spreader—Handles salt, cinders and sand for heavy-duty ice control. Pea gravel and chips for seal coating. Choice of PTO, hydraulic or gasoline engine drive, cab-controlled. Uses the only power transmission of its kind in the field. No worm gears, no "out-of-straight" shafts of U-joints. Differential equalized drive.



Flink HD42 Hydraulic Drive Tailgate Spreader—Consistently picked by smaller communities that need both faster ice control and seal coating in the same low-cost rig! Self-feeding. Handles all Chlorides and abrasives. Spreads from width of truck to width of street, thick or thin. Replaces tailgate on present trucks. Trips for dumping just as original tailgate did.



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nance dollar and 19.6 percent on urban sections. A recent study of annual maintenance costs of signalized intersections, lighted signs and safety lighting showed: 1) An average cost per signal head (in a 12 to 15-head intersection) of \$58; 2) maintenance of electrical facilities, power charges and lamp replacement for lighted signs varied from \$130 to \$190 per sign; and 3) maintenance, power charges and lamp replacement for highway lights cost from \$62 to \$73.50 per standard. Maintenance costs are inevitably going to increase as the completed mileage on the Interstate System grows. Along with the effects of the larger, more complex facilities, costs will reflect the higher standards of maintenance expected on this new highway system.

"Maintenance," F. E. Baxter, Maintenance Engineer, California Division of Highways, *California Highways and Public Works*, July-August, 1960.

Snow And Ice Control

The New York State Thruway Authority in cooperation with the Calcium Chloride Institute, conducted a research program on the use of chemical mixtures of calcium chloride and rock salt for snow and ice control during the winter of 1958-59. The Weedsport Maintenance Section (approximately 32 miles in length) was used as the test area with 10-mile portions of the adjacent sections on either side used as a basis for comparison with normal procedures employing salt and abrasives. A mixture of two parts salt to one part calcium chloride by volume (with some variations and with different proportions of abrasives) was used in the test operation. Bulk calcium chloride was stored in a wooden frame structure with a canvas front and no crusting or hardening difficulties were encountered. Handling and mixing procedures included: Loading alternate layers of the materials into the spreader truck hoppers; premixing materials with a front end loader; and premixing with a belt conveyor fed from two hoppers, one containing salt and one calcium chloride. The last mentioned method proved to be the most effective. Observation and evaluation of reports on the program in the test section for the winter season resulted in the following conclusions: 1) The mixture had a faster melting action than straight salt with a greater difference at lower temperatures; 2) pavement was cleaned in 15 to 20 minutes after mix appli-

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SHOULDER MAINTENANCE

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cation at temperatures in mid 20's; 3) abrasives held to pavement better when mixed with chemical mixtures; 4) no glazing of surface resulted from sudden temperature drop as was the case with straight salt; 5) speed and length of spread per truck increased with reduced "throw" and "bounce" of the chemical mixtures; 6) premixed stockpiles were stored without protection for over a week with no crusting except after rainfall when a 2-in. crust developed which was easily broken; 7) satisfactory mix for most storms was two parts of chemical mixture (2:1 salt to calcium chloride by volume) to one part of abrasives; 8) no salt residue was visible after storms cleared or at season's end; 9) spreader truck hoppers could not be preloaded without developing caking problems after standing for a few hours; and 10) calcium chloride caked on wires and motors of equipment requiring covering to prevent ignition shorts. Cost of materials resulted in a ton of straight salt having a value of \$13.65 per ton, the salt-calcium chloride mixture \$17.36 per ton and the chemical-abrasive mixture \$10.95 per ton. Further experimentation was scheduled for the following winter season.

"Chemical Mixture Test Program In Snow and Ice Control." C. H. Lang, Chief Engineer, New York Thruway Authority and W. E. Dickinson, Chief Engineer, Calcium Chloride Institute. *Highway Research Board Bulletin 252*, 1960.

**City Provides
Public Parking**

The Evanston, Illinois, City Council embarked on a public parking program 12 years ago by: 1) installing, in 1948, 1,219 curb parking meters and using the revenue through a Parking System Fund for the exclusive development of off-street parking; 2) establishing 11 off-street parking lots during the first four years; 3) issuing, in 1952, revenue bonds in the amount of \$900,000 for the acquisition and development of three major downtown lots; 4) amending zoning ordinances and street parking regulations to require certain parking spaces with the construction of new buildings and to alternate side of street parking to facilitate cleaning and snow removal. While the private enterprise system of providing services is often to be desired, there were a number of factors favoring municipal action in this program: 1) Municipal evaluation of the problem could best reveal the total need; 2) terms and interest rates for borrowed money to

don't let this happen on your roads...

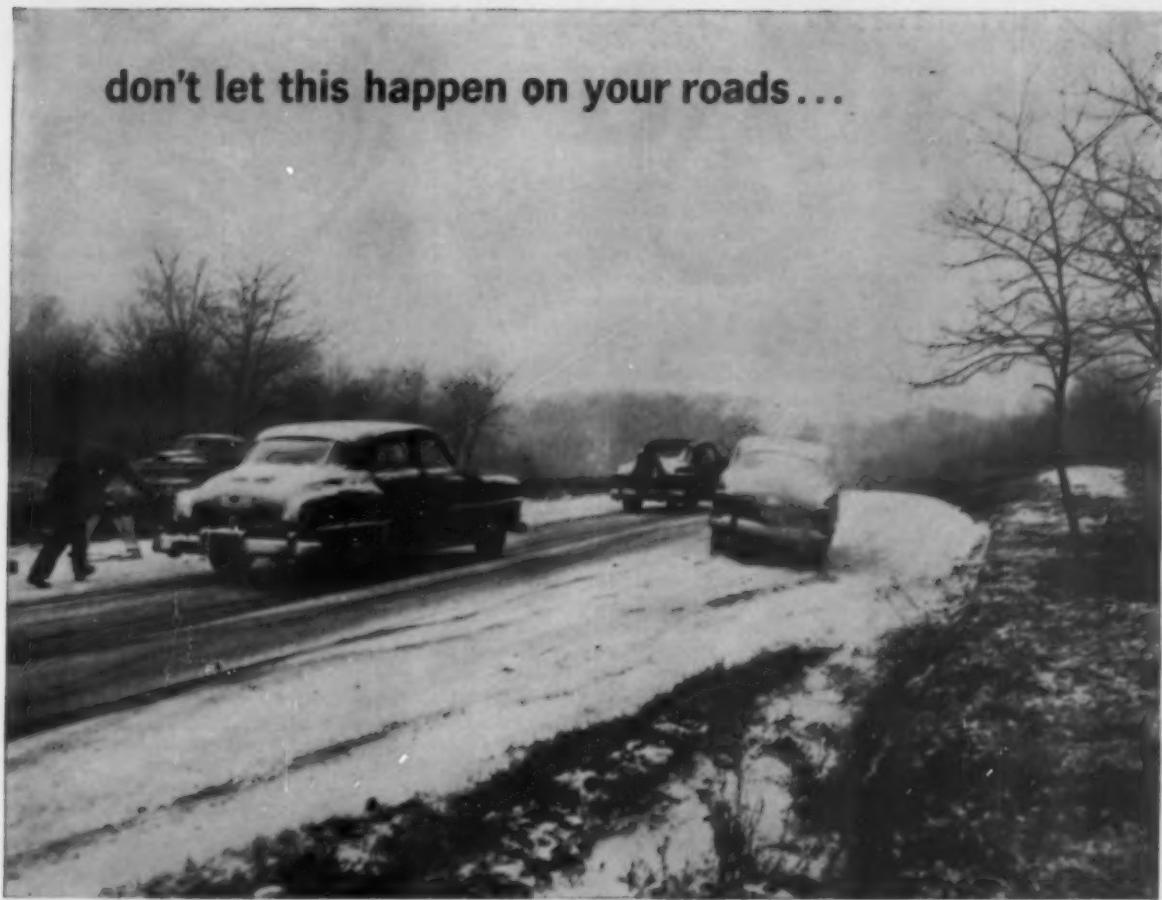


Photo courtesy Bureau of Public Roads, Dept. of Commerce

Icy roads like the one above are quickly changed to safe, bare pavements with Columbia Calcium Chloride-rock salt mixtures.

CLEAR ICY PAVEMENTS FAST with Columbia Calcium Chloride-rock salt mixtures

No other ice and snow control material offers these Columbia Calcium Chloride-rock salt mixture advantages:

BARE PAVEMENT FASTER: Test results (right) prove the ice melting action of Columbia Calcium Chloride-rock salt mixtures. And, mixtures give you a uniformly clear pavement, free from treacherous patches of ice.

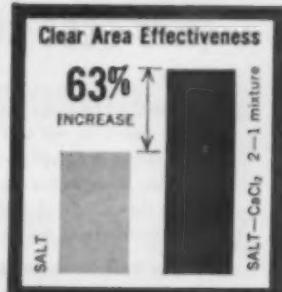
ALL-TEMPERATURE EFFECTIVENESS: Columbia Calcium Chloride-rock salt mixtures assure quick melt at all temperatures—from freezing to sub-zero.

SAVE TIME, MONEY: Columbia Calcium Chloride and rock salt mix easily, can be stored indefinitely, ready for instant use with minimum shelter required. Bulk purchase and storage help stretch maintenance budgets.

It isn't too late to order your Columbia Calcium Chloride and rock salt. Get your order in now to keep your roads safe this winter.

For more information write to our District Sales Office nearest you or to our Pittsburgh Address:

Clear pavement area two hours after application of calcium chloride-rock salt mixtures is 63% greater than salt alone in 25-30° temperature range.
(Based on field studies in Michigan sponsored by the Calcium Chloride Institute)



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finance the work favored the public agency; 3) the power of eminent domain could be employed where required to assure proper development without exploitation by property owners; 4) the city could better subsidize parking lot operations through street parking meter revenues and tax exemptions; and 5) city owned lots would have better assurance of permanency than those whose private owners might be tempted to sell for a profit. Financially the Evanston parking utility is a success with revenue more than adequate to finance existing lots and permit limited expansion. The success of the program can also be measured in terms of a healthy growth in downtown retail sales volume and assessed property valuation.

"The Case for Public Parking," Bert W. Johnson, City Manager, Evanston, Illinois. *Ohio Cities and Villages*, September, 1960.

Metropolitan Expressways

In District 10 of the Illinois Division of Highways, which comprises all of Cook County, a special Expressways section has been established to plan, design and operate expressways in the Chicago Metro-

politan Area. Coordination of the city, county and state interests and participation in this work is handled by a Metropolitan Highway Design Committee made up of the heads of the highway departments of the three agencies. Annual expenditures of \$100,000,000 are required to carry out the planned programs and additional amounts are anticipated for future facilities. Sections of the Calumet, Edens and Congress Expressways, completed and opened to traffic, have already shown that certain features designed in 1952 are now obsolete. The 14-ft., 3-in. clearance of the Calumet Expressway over the Kingery Expressway has created several accidents. Light standards set back only 7-ft., 6-in. from pavement edges on the Eden Expressway show a high incidence of damage and reduce the effective width of shoulders. Many partial interchanges are now insufficient to handle changing traffic patterns. Visionary planning for the Congress Expressway has been proven sound. Split diamond interchanges have accommodated traffic patterns unsatisfied by the partial interchanges on the other facilities. Center ramps with long acceleration (1100 ft.) and deceleration (800 ft.) lanes were necessitated by the loca-

tion of railroad and rapid transit facilities within the depressed right-of-way section. Construction work is underway on the Northwest Expressway; demolition is being carried out to permit construction of the South Expressway and in various planning or design stages are the Southwest, Moline and Cross-town Expressways. Traffic operations on these facilities have and will require careful traffic engineering. Reversible lanes planned for the Northwest Expressway will be controlled by a system of signals, signs and physical barriers. To supplement policing forces on the expressway system, the Division of Highways is considering the establishment of an emergency service organization to maintain an around-the-clock patrol of the expressways by trained men in vehicles equipped to: Establish emergency controls and detours; report and assist at accident scenes; clear pavement of debris and obstructions; assist disabled vehicles; and provide routine reconnaissance. Maintenance procedures and equipment are also undergoing study to meet the problems created by heavy, high-speed traffic and the multiplicity of appurtenances such as signs, signals, lighting, traffic counters and lane mark-

Baughman Model K-5 S-C

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Less than 15 minutes after a bad weather alert, dump trucks can be ready to roll as full-fledged ice-control units. This fast conversion is simple with the Baughman Model K-5 S-C Spreader Body — the remarkably versatile spreader that is saving thousands of dollars for street and highway departments throughout the United States.

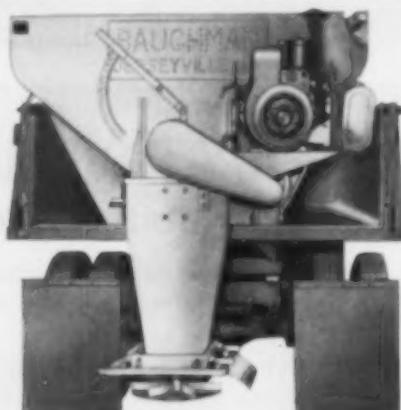
The Baughman Model K-5 S-C hoists readily into any standard dump body, secures with turnbuckle hold-downs. Spreader holds 5.5 cu. yds. of salt, cinders, sand; discharge is a one man cab-controlled operation. Width of spread and density are completely adjustable. Wisconsin auxiliary engine.

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On DeKalb County, Georgia, streets and roads . . .

Modern soil-cement — the economic answer to urban county "population explosion"

"Soil-cement has proved so satisfactory that in the last 4 years we have annually placed this type of pavement on 12 to 15 miles of subdivision streets."

That's what DeKalb County engineers report—and it's typical of reports from many street and highway departments. One good reason is low maintenance costs. Soil-cement stays lastingly solid. That's

why it won't wash out or pothole.

Soil-cement is economical to place because 75% of the materials usually are free: soil, old gravel roads—even broken-up blacktop—mixed with portland cement and water, then rolled solid. A thin bituminous topping completes the pavement!

Soil-cement is waterproof, can withstand rain the day it's placed. And core tests show soil-cement

gains in rock-hard strength as it ages.

These are solid reasons why soil-cement is the fastest-growing low-cost pavement for roads, streets, shoulders, subbases, airports and parking lots.



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Every mile is two in winter.
—George Herbert: *Outlandish Proverbs*

No, GEORGE. Not every mile. Just the slippery ones. They're the miles that slow you down... and sometimes stop you cold.

Of course, it's only fair to point out that this fellow George Herbert lived about two centuries too soon to see a road cleared by calcium chloride. When he said what he said, he was right.

Nowadays we don't wax philosophic about winter roads. We go to work on 'em. And I'd be the last man to say it's easy work. But chloride makes it a lot easier in many ways. Speeds the melting action of salt. Works at sub-zero temperatures. Helps keep abrasive storage piles free-flowing—so you can tackle 'em with a shovel instead of a pick.

What chloride-salt mixtures save is time, and work, and lives. No doubt you use chloride. But our booklet, "Melt or Skidproof Icy Surfaces with Wyandotte Calcium Chloride," might suggest to you some new and better ways to use it. Write us for a copy. *Wyandotte Chemicals Corporation, Wyandotte, Michigan. Offices in principal cities.*

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MICHIGAN ALKALI DIVISION
HEADQUARTERS FOR CALCIUM CHLORIDE

ings required on the expressways.

"The State's Role in Chicago Metropolitan Expressways." *Traffic Engineering*, September, 1960.

Snow Removal By Heat Application

Three main methods have been employed or are currently practiced for removing snow by the application of heat: 1) Snow melters where snow is fed into a mobile melting chamber; 2) snow "burning" appliances where open flame is applied to the snow covered surface; and 3) road heating devices where a network of heating elements is embedded in the pavement. Snow melters are used by Canadian railroad companies but no successful application of this type of equipment on roads is known. Snow burning equipment has been tested in England as long ago as 1947. Equipment tried has included oil-fired road heaters, flame guns and, on at least one occasion, an aircraft jet engine. Road heating is employed in various locations in the United States. Oils or water and anti-freeze solutions pumped from a heating source through an embedded pipe system are commonly employed. Electrical road heating has been in use for several years in Switzerland and some experimental installations made in England. The heating elements used are expanded steel reinforcement or insulated resistive cable. The Road Research Laboratory (England) is now experimenting with the use of graphite powder mixed with the pavement surface material so that the "crust" of the roadway might carry the electrical current. So far only electrical heating has been a feasible thermic method and because of the high energy requirements, even this is practical only on short stretches of roadway.

"Giving Snow The Heat Treatment." W. E. Weislog. *Public Cleansing* (London, England), August, 1960.

Highway Legislation

The 1961 Congress of the United States faces some fundamental decisions concerning highway legislation. First is the question—do we intend to complete the Interstate System on schedule? Under present legislation, future apportionments will be insufficient by about \$9.5 billion to pay the Federal share of the system. A closely related policy decision will have to be made on how the necessary revenue will be raised. In January, Congress will have the new Interstate cost esti-

mate and the results of a four-year Bureau of Public Roads study on highway tax equity. While this data will provide Congress with better information than previously available, it may require great courage to enact legislation required to keep the program on schedule in the face of the assured efforts of every organized group to resist increases in its tax burden. In any evaluation of the highway program, recognition must be given to the relationship of the Interstate System and local roads. While there are differences of opinion on how and to what extent local needs should be considered in the design and construction of the Interstate System, in the operational phase other state highways and local roads and streets become an actual part of the Interstate network. Thus a balance of progress on Interstate and other Federal-aid roads is a recognized necessity in Washington, even though the relationship between the two programs is not as widely understood as is desirable. Road builders in industry and government must actively support a soundly-financed, long-range, balanced highway program.

"Highway Legislation in 1961." Louis W. Prentiss, Executive Vice President, American Road Builders' Association. Paper presented at 8th Annual National Highway Conference for County Engineers and Officials, Atlanta, Georgia. September, 1960.

Other Articles

"Properties of Highway Asphalts—Part II, Various Penetration Grades." By the Division of Physical Research, Bureau of Public Roads. October, 1960.

"How a Contractor Placed Wire-Mesh in Concrete Pavement—By Machine." By Glen S. Paxton. *Roads and Engineering Construction* (Toronto, Canada), September, 1960.

"Recent Developments in the Hydraulic Design of Culverts." By Lester A. Herr, Chief of Hydraulic and Hydrological Branch, Bridge Division, Office of Engineering, Bureau of Public Roads. Paper presented at 8th Annual Highway Conference for County Engineers and Officials, Atlanta, Georgia, September, 1960.

"Moving Today's Traffic on Yesterday's Streets." Increasing street capacity through better signal control, traffic signing, pavement marking and channelization. By John A. Bruce, Traffic Engineer, Denver, Colorado. *Colorado Municipalities*, September, 1960.

"The Computer As An Aid to the Municipal Engineer." The way in which representative problems can be solved and the facilities that a computer or other punched-card equipment can provide. *Municipal Engineering* (London, England), September 2, 1960.

the Modern Trend in LOW LEVEL LIGHTING



TOP PHOTO: Location: Rath Park, Franklin Square, L. I., N. Y.
Architect: Herbert D. Phillips
Consulting Engineers: Barstow, Mulligan & Vollmer
LOWER PHOTO: Location: Fairleigh Dickinson University, Madison, N. J.
Electrical Consultant: H. L. Sykes

modern lighting at a realistic cost

Here are two contemporary outdoor lighting installations — one an all new municipal swimming pool and recreational area — the other, a prominent New Jersey University. Both chose the P&K all aluminum CIRCLElux lighting package to illuminate and compliment their roadways, walkways, landscape and architecture.

The sweeping lines of the P&K CIRCLElux davit blend with the modern one story architecture of the Rath Park Swimming Pool. Yet, the modern, but stately, design of the P&K CIRCLElux post is in good taste with the traditional architecture of Fairleigh Dickinson University. The CIRCLElux lighting package is the correct low level lighting choice to compliment almost all types of architecture.

The P&K CIRCLElux is available in a wide range of davit styles and mounting heights. The post is available in one basic design but at various mounting heights and with the CIRCLElux you have a choice of three light sources — incandescent, mercury vapor and fluorescent. This combination of luminaires and davits or posts will enable you to specify "packaged" lighting units. This means easier specifying by using matched components which in turn can customize your lighting projects. Send in your reservation now for the new CIRCLElux catalog.



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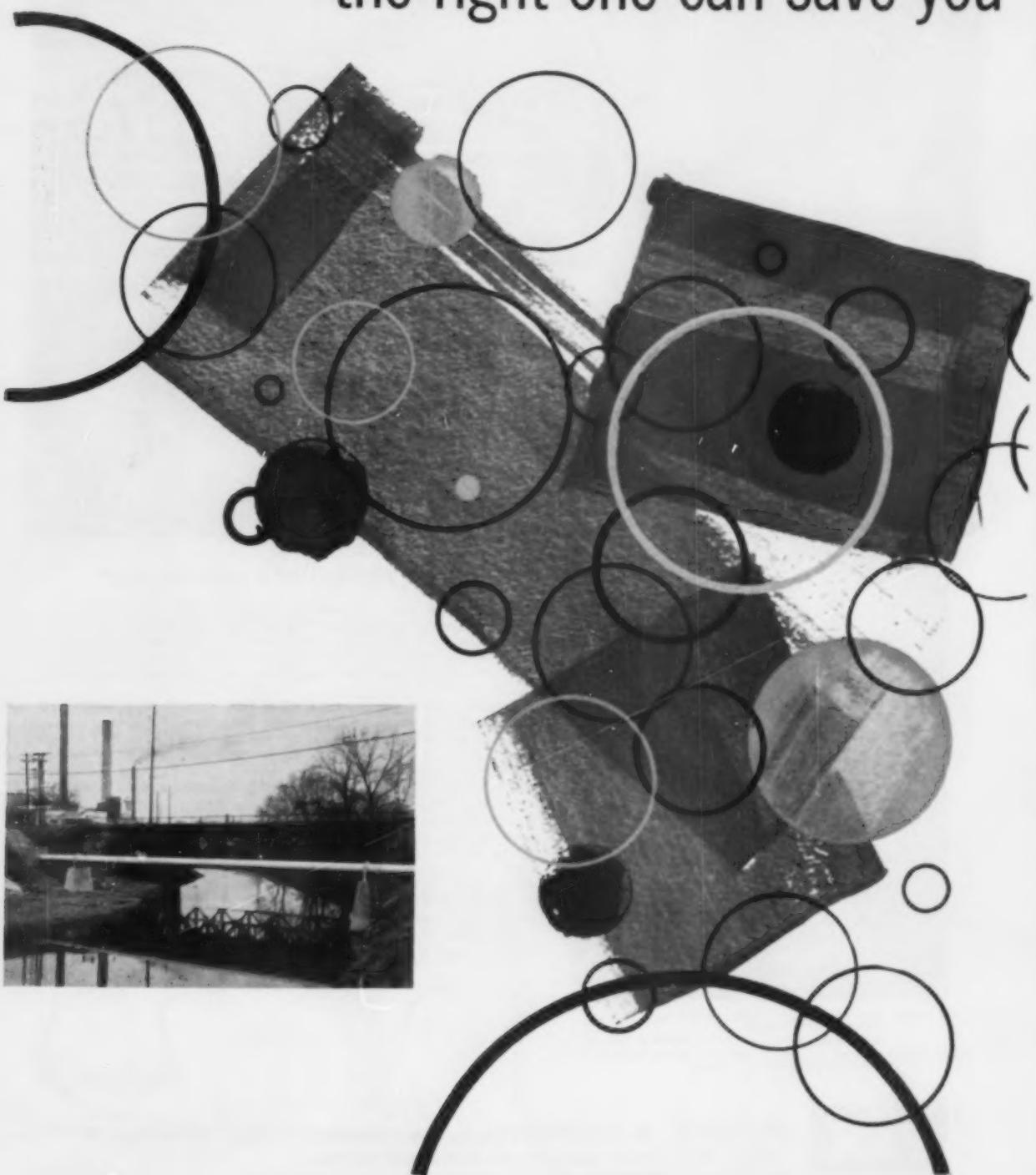
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Is the extra weight a significant amount? Consider this example: In one mile of 14" OD pipe, the weight difference between .172" wall thickness and .188" wall thickness is **six tons!** In larger pipe, the weight difference is even greater.

Arrange now to discuss your Welded Pipe requirements with your nearby Armco man. Armco Pipe is made to meet the applicable Standards of AWWA and Underwriters' Laboratories, Inc., and ASTM Specifications. Use the coupon to tell us your needs. No obligation! Armco Drainage & Metal Products, Inc., 5000 Curtis Street, Middletown, Ohio.

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MARYLAND PLANTS FIRST "LIVING WINDSHIELD"

WILLIAM F. HALLSTEAD

THE Maryland State Roads Commission installed the State's first highway wind reduction planting this spring, a dense evergreen planting about 1,000 feet in length.

The need for the windbreak had been pointed up primarily by accidents involving vehicle-drawn house trailers. Where U. S. Route 50 crosses the South River in Anne Arundel County west of Annapolis, the river valley channels winds at quite high velocities across Route 50. Emerging from cuts on either approach to the river crossing, drivers have been encountering unexpectedly strong winds, at the crossing. The sudden buffeting has been particularly serious where the vehicles have been towing house trailers with their large "flat plate" areas.



● EVERGREEN "windshield" planting may be seen at right parallel to the guardrail.

The river at this crossing is about 80 ft. wide, and the valley extends for some 1,100 ft. along the roadway. The planting, mostly fast growing, long-needed pines, has been installed along almost the entire south slope of the 4-lane highway where it crosses the valley. To supplement this planting, an additional screen of dense shrubbery will be planted in the median for some 700 ft.

Because the trees on the south

side of the highway were, by necessity, planted on a down-slope, their wind reduction effect will not be felt for at least another year, perhaps longer; but the important point is that the screen is underway. The evergreens are planted in a double row on about 15-ft. staggered centers.

The planting, under the direction of Charles R. Anderson, State Roads Commission Landscape Engineer, cost about \$2,300.



TARCO Dump Body HOPPERS for Straight De-icing Salts

Gravity feed . . . no moving parts.

Tarco "Watchman" Hoppers in two sizes: Model 3Y—3 cu. yd.; Model 5Y—5 cu. yd. (Model 1Y—1 cu. yd. for "Jeeps" and pickups). All welded steel. Top screens and tie-down clamps.

Rugged "Watchman" Hoppers used with Type V-3 Electric Cab-Controlled "Scotchman" Spreaders make ideal one-man operated spreaders. Spread with body in normal "down" position. Install or remove the Hopper and Spreader in 20 minutes.

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OPERATING SANITARY LANDFILLS DURING EXTREMELY COLD WEATHER

C. L. BRADLEY

Mr. Bradley is Supervising Sanitarian in the City Health Department of Fargo, North Dakota, and submitted this paper for publication through the courtesy of "The Sanitarian."

The sanitary landfill is an effective and proven method of permanent disposal of all types of non-salvageable refuse. Experience has indicated that where suitable land is available, this method of refuse disposal is economical and has a definite value for the reclamation of otherwise useless land.

In 1947, the North Dakota Water and Sewage Works Conference appointed a committee to study the refuse collection and disposal problem in the State. The study indicated that of the 135 municipalities surveyed, 129 used the open dump type of landfill. North Dakota is sparsely populated, and because of laws limiting tax levies, few cities were able to afford the purchase and operation of incinerators. While the severe winters of this area made the Health Department question the practicability of this method in North Dakota, it was decided to invite the Public Health Service to cooperate in a study of landfill operations in the State.

The City of Mandan, population 7,298 (1950 census), was selected in March, 1949, as the site of the experimental project. The services of an engineer were provided by the Public Health Service along with the necessary equipment for a one-year period. A front-end loading tractor was loaned to the city by a manufacturer. Mandan donated the site, hired the tractor operator and assumed other costs. The State provided traveling expenses and office space, and the City indicated it would continue the landfill if it proved to be successful.

Fargo, population 38,256 (1950 census), put its intra-city sanitary landfill into operation on October 5, 1954. The fill was located in the industrial area of the city, approximately two blocks from a residential district. It covered approximately 3½ acres of what was formerly waste land along a county drain. The land, owned by the City, would

be of considerably greater value as a reclaimed section than it was previously, as it could be used as a recreational area, parking lot or as a site for light industrial purposes when completed. In the Fargo operation, dirt was dug from the bottom of the area by an Allis Chalmers HD-9G crawler type tractor with a two-yard front end loader, to form sides for the trench or dikes and cover for the entire operation. Refuse was dumped at the bottom of the ramp or slope, then material was compacted against the sloped section in layers. This placing and compacting operation was continued throughout the day as additional truck loads were dumped. At the end of the day, the accumulation of refuse was covered with a layer of dirt 6-in. thick. This prevented the cell from becoming a nuisance. A series of these cells were built up until the trench was filled to approximately 1½ ft. below grade level. After a final cover of dirt 2-ft. thick was applied, the completed fill was 6 in. above grade level to allow for future settling. Cover material was protected from frost by a layer of leaves gathered from street department sweepings during the fall.

The City of Minot, population 22,032 (1950 census), ceased the operation of its "semi-landfill" in July, 1956 and began a genuine sanitary landfill within the city limits, in a ravine adjacent to the south side of the municipal airport. After one year of operation city officials indicated satisfaction with the method and considered the operation, generally speaking, highly successful.

Landfill Planning Criteria

The interested community should select a site as close as possible to the populated area to hold down cost of collecting and hauling the refuse. The cost of the sanitary landfill itself should generally run approximately one-sixth of the refuse collection cost.

A sandy light soil is best suited for the sanitary landfill but operations may be carried out satisfactorily with other soils if necessary adjustments are made to fit the specific soil situation. In the Fargo area, we have a very heavy, tight, clay "gumbo" soil. During the extremely

cold winters when the temperatures drop to as much as -40°F., it has been necessary to blast with dynamite to loosen up the frozen chunks.

The amount of refuse may be estimated to be at the rate of two pounds per person per day. Volume may be figured as one cu. yd. of compacted refuse weighing 300 pounds, or approximately 2 cubic yards of refuse per person per year. A municipality of 15,000 population should therefore dispose of around 30,000 cubic yards of refuse annually. Of course the rate would vary with the season of the year, and with the commercial and industrial complexes of the area.

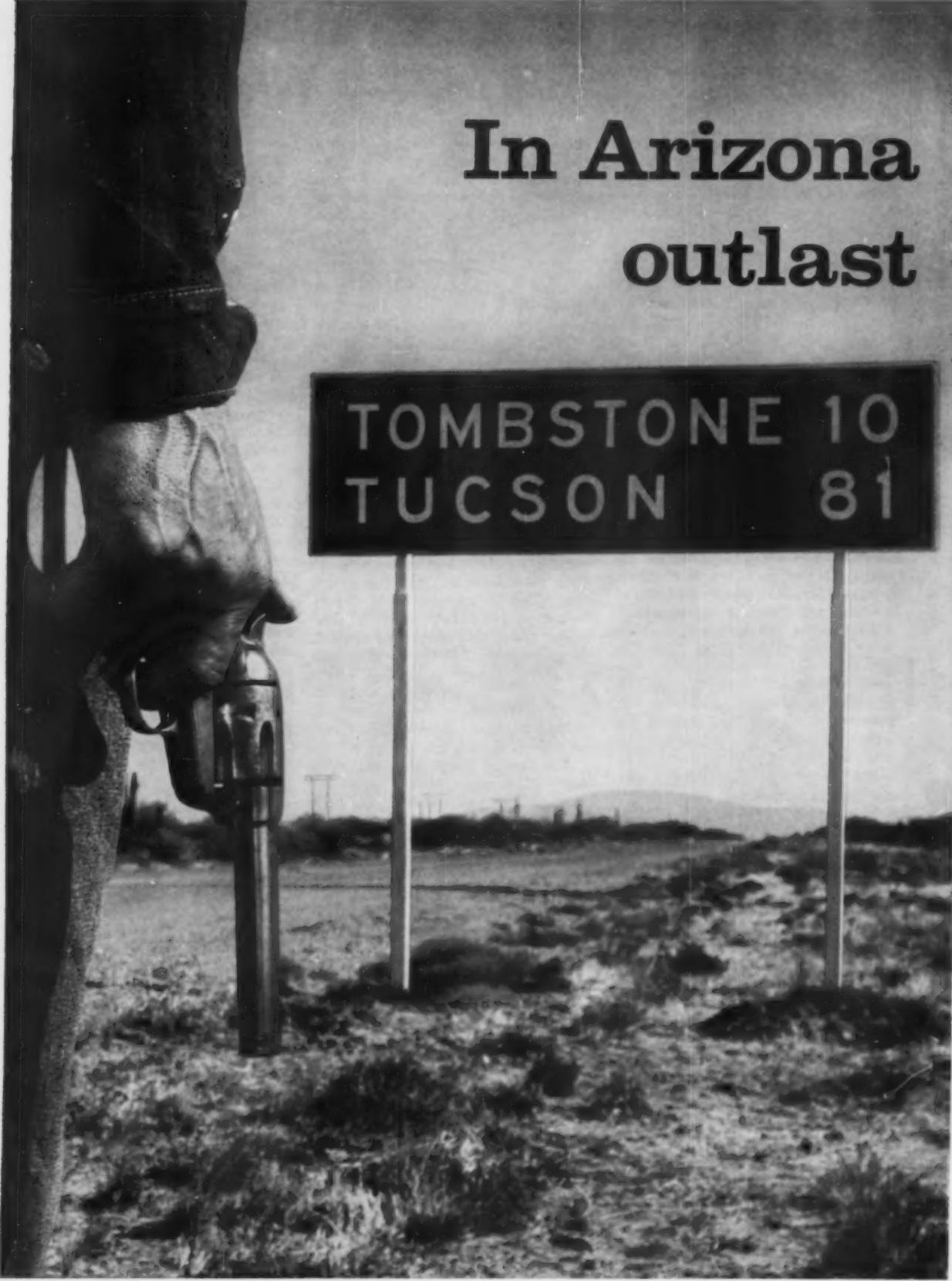
A small crawler-type tractor with a ½-cu. yd. front end loader is recommended for towns of 1,000 to 5,000 people. A medium sized unit with a 1-cu. yd. bucket is applicable for communities of from 6,000 to 20,000 population, and a 2-cu. yd. bucket should be considered minimum for cities of from 20,000 to 50,000. At present, in Fargo we now have one Allis Chalmers HD-9G with front-end loader, supplemented by a Caterpillar D7, with a dozer. The HD-9G is used primarily for compacting and covering; the D7 is used mostly for excavating purposes. In locations where the water table is close to the ground surface, a dragline may be used to remove the earth to a point adjacent to the low area, where it can be stored until needed for cover material.

The small community of 5,000 or less population might profit from considering the following general principles:

- 1) Utilize the tractor in as many ways as possible. The machine would, in all probability, only have to be used two or three hours each day, and could be used for other purposes, such as snow removal, street excavating, gravel loading, etc., by other departments.

- 2) Make use of a small farm type tractor only after first making certain that large objects such as trees, car bodies, etc., are removed. This could be done by designating a separate dumping area and burning table for such objects.

- 3) Each spring, incorporate the larger objects into the fill, burn the accumulated brush, and dig a new trench.



In Arizona
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SIGN REPLACEMENT WAS A REAL PROBLEM IN ARIZONA until the Highway Department switched to plywood. Trigger-happy motorists had been taking pot shots at metal signs. This led to rust, deterioration and often dangerously reduced legibility after only a few months of use. Then performance tests showed overlaid plywood's life expectancy was at least three times that of metal.

Now Arizona uses overlaid plywood for 85% of its signs. Vandals still shoot at them. But plywood stands up to both deliberate and accidental abuse without losing legibility. Bullets go right through without shattering the sign face. There's no corrosion problem; repairs are made quickly.

Overlaid plywood withstands Arizona's weather, too, with its extremes of heat, rain and snow. The plywood is completely waterproof, and the smooth, durable plastic-like surface makes an ideal base for reflectorized material.

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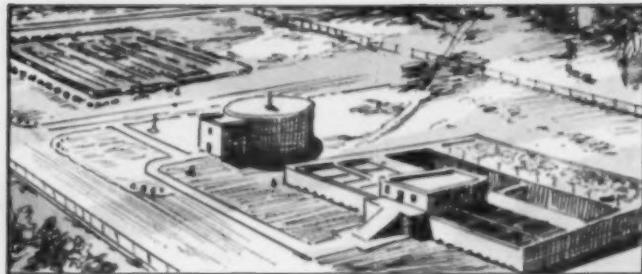
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Plywood signs on Arizona's highways not only resist abuse from vandals and a rugged climate, but are attractive and easy to read. Fabrication in the state's sign shops is simplified because standard-sized panels of plywood are easy to store and easy to cut to required sizes and shapes. Above, reflectorized letters are applied to an overlaid plywood sign.

THE
SEWERAGE
AND
REFUSE
DIGEST



Prepared by ALVIN R. JACOBSON, Ph.D.

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

**Reconstructed
British Plant**

The City of Derby, England, has recently placed in service their newly reconstructed sewage disposal plant capable of treating the sewage from an ultimate population of 200,000 and the 6 mgd (Imp) of trade wastes from British Celanese Ltd. Reconstruction had been expedited by a court order obtained by a group of citizens to abate river pollution. The reconstructed plant has some features which are quite different from those seen in the United States. See Figure 1. The trickling filters are rectangular and dosed from distributors which are pulled back and forth over the filters by cables. The influent to the filters is fed to the distributors from a channel between each section. Also different and interesting is the provision for the use of alternate double filtration. Some twelve secondary tanks are provided with the piping such that it permits their use for either settling between the two stages of filtration or as final settlers. Many of the other features described reflect the differences between American and British practices in sewage treatment. Detailed descriptive information accompany each of the several photographs of the plant and equipment included in this article.

"A Reconstructed British Sewage Works." By J. Grindrod, New Milton, Hants., England. *Water & Sewage Works*, September, 1960.

**Pollution Control
for Our Nation**

Pollution control activities that have been undertaken during the past several years and the activities that are necessary to meet the water supply and water pollution control needs of this Nation are presented in this comprehensive article,

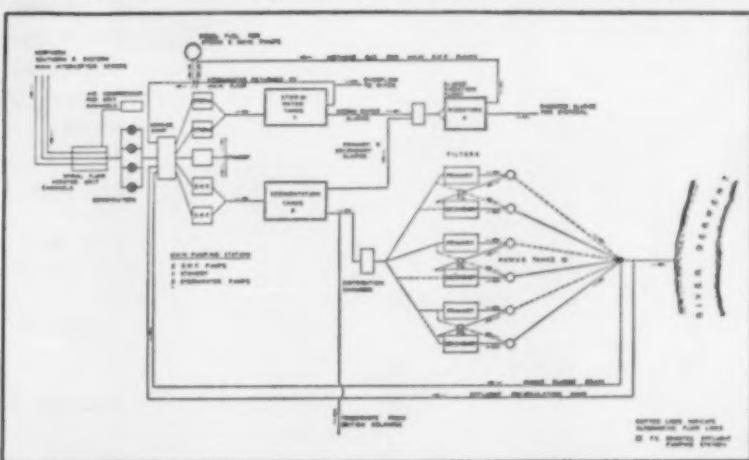
data for which was obtained from Public Health Service officials and engineers. Waste treatment needs throughout this country include some 2900 new plants for communities now discharging raw sewage to streams, 900 obsolete plants to be replaced, and 1600 plants that need enlarging or improving. To wipe out the backlog and to meet the new needs will require the cities of this country to spend \$600 million a year for the foreseeable future. It is believed that industrial waste treatment needs parallel or exceed municipal needs. This article also discusses the present Federal Pollution Control Law and its administration; the nine - member Presidential Water Pollution Control Advisory Board and its functions; the basic data necessary on which to base control activities; and the research that has been undertaken and which is necessary to develop the means for more effective pollution control. Technical assistance is provided by the Public Health Service on request to the States when unusual municipal and industrial waste treatment problems

are encountered. More effective control of pollution is being brought about through comprehensive river basin planning, through legal action granted the Public Health Service under Public Law 660; financial assistance to States, construction grants to State, interstate, municipal or inter-municipal agencies to assist in meeting the costs of building sewage treatment plants. Other needs include improved methods of public financing, new legislation which will permit many States to provide assistance to municipalities for sewage treatment plant planning and construction, and financial incentives to stimulate the construction of waste treatment facilities by industry.

"Steps in Solving Our Problems of Pollution Control." *PUBLIC WORKS*, October, 1960.

**Wet-Oxidation
of Sludge**

The Metropolitan Sanitary District of Greater Chicago has contracted to spend approximately \$13 million for a wet oxidation plant to



● FIG. 1. Flow sheet for reconstructed sewage treatment plant at Derby, England.

Courtesy Water & Sewage Works



P.F.T. at FLORA, ILLINOIS

new U.S. center of population

From coast to coast America is growing. The progress of the past, the vitality of the present together with the social, economic and technological advancements have given us an assurance of a dramatic and expanding future.

Sharing in this growth, and now the new center of population in the U.S., is the aggressive, spirited community of Flora, Illinois. One of Flora's civic improvements is its sewage treatment plant. A program of modernization of facilities has provided this city with a plant that employs the finest in sewage treatment processes—P.F.T. Controlled Activated Sludge and P.F.T. Controlled Digestion.

P.F.T., like Flora, is the center of attention when specifications call for the finest in waste treatment equipment. The eyes of the nation are on Flora. The eyes of consulting engineers who want only the best in process and equipment for sewage treatment plants look to P.F.T., the company keeping in step with tomorrow—today.

*Design of sewage treatment plant improvements
by Crawford, Murphy and Tilly, Consulting Engineers*

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PUBLIC WORKS for November, 1960

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PROJECT: **COMPLETE AND ULTIMATE
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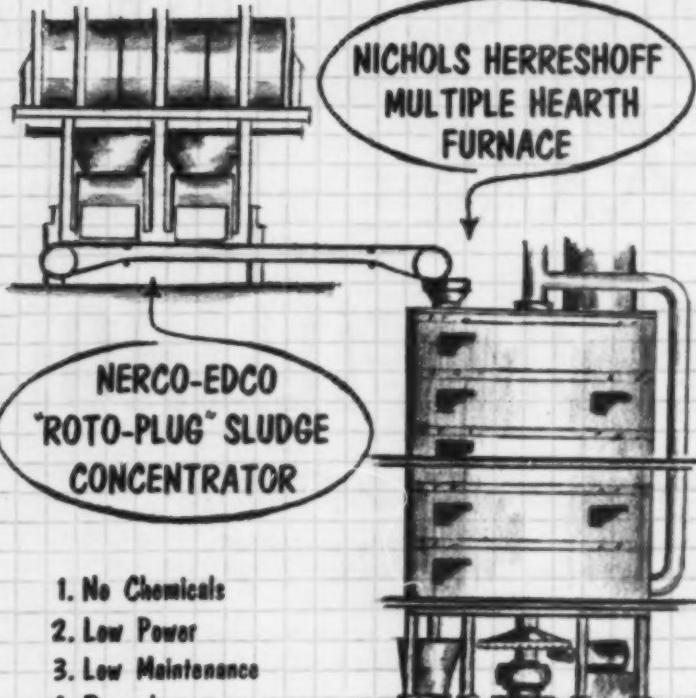
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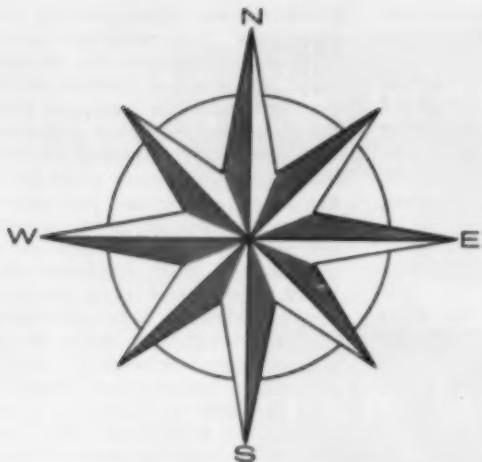
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handle 200 dry tons/day of sewage solids at 3 percent concentration. This method of sewage solids disposal was selected after a series of pilot plant studies carried out by the Metropolitan Sanitary District. This process is a method of incineration or wet combustion which uses the principle of chemical oxidation, under pressure, and at elevated temperatures to destroy the combustible material in the liquid sludge. Oxidation takes place at temperatures above 300° F and the efficiency is proportional to the increase in temperature, being most efficient between 400 and 650° F. The physical units of a wet air oxidation plant are (a) an air compressor; (b) a sludge pump designed to pump against the desired pressure, plus auxiliary feed pumps; (c) a reactor to support the oxidation process; and (d) a series of heat exchangers to recover energy developed by the wet burning of the sludge. The economy of this process depends on the recovery efficiency of the energy produced which is a function of the sewage solids concentration. The reactor effluent is characterized by high ammonia and high volatile acids content with the BOD ranging from 5,400 to 8,400 mg/L representing a 60 percent reduction from the original sludge. Several tables, graphs and illustrations are provided in this article.

"Wet Oxidation of Sewage Sludge." By E. Hurwitz and Wm. A. Dundas, Director of Laboratories and General Superintendent, respectively, The Metropolitan Sanitary District of Greater Chicago, Chicago, Ill. Journal, WPCF, September, 1960.

**Vacuum
Filtering**

The new sewage-industrial wastes treatment plant placed in operation in 1959 and now serving the City of Ogden, Utah and surrounding areas was designed for a population equivalent of 314,000. At present the plant serves a domestic population of 88,000 inhabitants and industry having a population equivalent of 128,000. The large variety of industrial wastes has provided a difficult and ever-changing combination of solids in the raw sewage, creating problems of sludge disposal, especially during the dewatering by vacuum filtration. The treatment plant consists of two mechanical bar screens; three grit separators, three primary clarifiers, twelve trickling filters with rotary distributors, three final clarifiers, and two vacuum filters. The plant removes



*The Key to Low-Cost
Sewage Treatment
Over All America*
"SUBURBIA"



TYPICAL NORTHERN INSTALLATION, shown above, goes below-grade to take advantage of residual ground warmth during colder winters. This one serves 700 homes (245,000 gallons per day) in Gracemor Subdivision, Kansas City North, Missouri. Another northern installation, serving a 3,000-student branch of Michigan State University (and its new 700-home community) has recently been completed near Pontiac, Michigan.

TYPICAL SOUTHERN-STATES INSTALLATION, in lower photo, can go above-ground. Costs drop when tanks need not be buried, true of most of the South. This installation serves 300 homes (105,000 gallons per day) in the Corrine Terrace Development, Orange County, Florida. Another typical southern installation serves 118 homes (41,600 gallons per day) in the Debra Heights Development, St. Petersburg, Florida, with good, low-cost sewage treatment.



All over America . . . bright new communities are rising, made possible only through the foresight of developers, consulting engineers and public works officials. For waste from these communities must be treated efficiently, and at low cost . . . and this is why so many thoughtful people are investigating "Suburbia," the sewage treatment plant priced to fit fringe communities.

This new type of installation provides conventional sewage treatment for communities of 200 to more than 10,000 homes. Because each installation is under the direction of consulting engineers, "Suburbia" invariably conforms to state and local Department of Health requirements.

"Suburbia" can be enlarged for permanent use, or can be dismantled and re-erected elsewhere with virtually complete salvage of components. Because they can be erected in 90-120 days (instead of 10 months, as for concrete-type plants), "Suburbia" can be ready to go on-stream almost as soon as sewage lines are completed.

FOR LARGER COMMUNITIES (involving 1000 or more connections) we can arrange a franchise plan for both the water and sewage systems through a utility company . . . which will furnish, install, own and operate all facilities without delay.

In any case, however, "Suburbia" involves less initial and operating capital than any other type of sewage treatment plant. "Suburbia" is installed and furnished, on a turnkey basis only, by . . .

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approximately 85 percent of the suspended solids and 80 percent of the BOD in the raw wastes. Sludge is drawn from the primary clarifiers and dewatered on the continuous-belt vacuum filters. Operating at a vacuum of 21 to 25 inches mercury, the plant consistently obtains a dry cake containing 70 percent or less moisture. Approximately 1.5 percent FeCl₃ and 7.5 percent CaO, on a dry solids basis, are being used to condition the sludge at a cost of \$9 per ton of sludge. The total cost of sludge disposal, including the above chemicals, power, labor and supervision, amortization

of trucks and landfill equipment and maintenance, has averaged \$15 per ton of dry solids.

"Vacuum Filtering a Tough Raw Sewage-Industrial Wastes Sludge." By Marland L. Davidson, Plant Manager, Central Weber Sewer Improvement District, Ogden, Utah. *Wastes Engineering*, September, 1960.

Pittsburgh's Sewerage System

During the past year the Allegheny County Sanitary Authority completed construction of the sewerage system to serve the City of

Pittsburgh and 70 neighboring municipalities. The sewerage system is presently designed for an ultimate population of 1,500,000 in the year 2000 with the treatment plant being designed to serve a population of 1,400,000 estimated for 1970. The sewage treatment plant facilities consist of pre- and post-chlorination, mechanical racks, aerated grit chambers, magnetic flow meter, preaeration tanks, sedimentation tanks, sludge and scum pumping stations, blowers, heat exchangers, sludge concentration tanks, sludge disintegrators, incinerators, ash lagoons and maintenance buildings. The total cost of the project is approximately \$100,000,000 which was financed through the sale of revenue bonds. The author presents a comprehensive account of the problems encountered in undertaking an important project of this size from its inception until its completion.

"Development and Design Features of the Pittsburgh Sewerage Project." By J. F. Laboon, Executive Director and Chief Engineer (Recently retired but has been retained as a Consultant), Allegheny County Sanitary Authority, Pittsburgh, Pa. *PUBLIC WORKS*, October, 1960.

Waste Stabilization Lagoons

This paper is a report of the Subcommittee of the Missouri River Engineering Health Council comprised of members from the States bordering the Missouri River. It provides a comprehensive picture of the design, construction and operation practices of waste stabilization lagoons found to be most satisfactory in these states and is based upon their collective experience during the past several years in several hundred installations. Waste stabilization lagoons have been adapted for successful use under highly varying conditions to provide intermediate, secondary, or higher levels of treatment. Variations in water quality, rainfall, evaporation, water consumption, soil conditions, nature and use of receiving watercourses, dilution water available, and other factors permit wide variations in design of lagoons. The report outlines experiences and practices that may be useful to those interested in this method of disposal. It covers the following points which should receive consideration prior to actual construction: most satisfactory location; area and loading requirements, whether multiple unit installations should be operated either in

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New pressures
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 new treatment
 plants . . .

Three national magazines* in the first months of 1960 have carried articles apt to alarm some fifty million readers about the possibilities and perils of polluted water supplies. More such stories can be expected to follow.

The Womans Clubs of America and the League of Women Voters are being alerted to them. The ensuing demands to clean up our waters by constructing sewage and waste treatment plants will rise far beyond the present experience of our engineers and public officials. (You get nowhere with telling women you cannot afford to provide what they consider their families' health and safety requires.)

* Reader's Digest, Good Housekeeping,
 U. S. News & World Report.

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An answer for the average community that is reasonable in cost, high in efficiency and longest in life is Trickling Filters. The just-issued TFFI Trickling Filter Handbook, including the new ASTM Specifications C 159-59 T, gives full information on them. If you lack a copy just ask the nearest Institute member listed here for yours.

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series or parallel, and types of interconnecting piping; amount of surface runoff to be permitted; type of dike construction; optimum liquid depth for adequate circulation; type of lagoon bottom; and size and location of influent lines and overflow structures. Whether industrial wastes should be permitted in lagoons depends upon whether or not they are amenable to biological treatment. The stabilization lagoon is considered as a proven method of waste disposal which should receive the same consideration as other methods of waste

treatment when engineering and economic analyses are being made.

"Waste Stabilization Lagoons—Design, Construction, and Operation Practices Among Missouri Basin States." By Willis Van Heuvelen, Jack K. Smith, and Glen J. Hopkins, respectively, Executive Officer, North Dakota State Department of Health, Bismarck, N. Dak., Executive Secretary, Missouri Water Pollution Board, Jefferson City, Mo.; and Regional Engineer, U. S. Public Health Service, Kansas City, Mo. *Journal, Water Pollution Control Federation*, September, 1960.

Other Articles

"Startup of the Hogsmill Valley Sewage Works, Part I." Unusual in that the plant was in operation almost a year at less than 50 percent of the design flow and it was close to two years before the entire sewage load was being received for treatment. H. H. Stanbridge and J. O'Neill, General Manager and Deputy General Manager, Hogsmill Valley Joint Sewage Board, Kingston-upon-Thames, England. *Water & Sewage Works*, September, 1960.

"A Study of Refuse Collection and Disposal Service." A small community makes a detailed cost study of its proposed new refuse collection and disposal program. By Melvin H. Diven, Borough Secretary, Mount Union, Pa. *Public Works*, October, 1960.

"Effect of Detention Time on Anaerobic Digestion." Results of the second phase of a laboratory study on the anaerobic digestion of raw sludge. By Ervin Hindin and Gilbert H. Dunstan, Assistant Sanitary Chemist, and Head, Sanitary Engineering Section, Division of Industrial Research, Washington State University, Pullman, Wash. *Journal, Water Pollution Control Federation*, September, 1960.

"How to Lick and Live With Grit." How the Hartford Metropolitan District has been able to lick some of these problems of grit handling. By George Lebetkin, Chief Chemist, Bureau of Public Works, Hartford County, Conn., Metropolitan District. *Wastes Engineering*, September, 1960.

• • •

Cost of Sewage Treatment

For 1959, according to the report of W. W. Mathews, Superintendent of the Gary, Ind., activated sludge plant, the cost of treatment was \$25.28 per million gallons, or \$1.63 per person per year. The cost per 1,000 pounds of BOD removed was \$13.50. The population served was estimated at 162,500.

South Dakota Meetings

The 26th meeting of the South Dakota Water and Sewage Works Conference was held in Watertown, Sept. 7 to 9, in conjunction with the South Dakota sections of the AWWA and the WPCF. Total registration was 144. Many interesting papers were presented. Officers for the Conference were elected as follows: President, W. Dale Mailoux, Rapid City; vice president, Darrell French, Huron; and secretary-treasurer, Don C. Kalda, Pierre. Officers for the newly formed S. D. section of the WPCF were Charles R. Price, president, Rapid City and N. A. Erickson, Sanator. Officers of the S. D. section, AWWA, were continuing in office, as follows: W. P. Wells, Aberdeen, chairman and Don Weasel, Mobridge, vice chairman.



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Public officials concerned with greater efficiency and upgrading working conditions in the Sewer Department will want to see a SewerRodeR demonstration when the team comes to their area. They'll see how one operator can rod from manhole to manhole non-stop, reaming out sludge and obstructions and restoring free flow in a matter of minutes. They'll see "case histories" showing the SewerRodeR can save up to \$264 per mile in cleaning costs, and pay for itself in six months!

They'll like these exclusive advantages: positive chain and dog non-slip rod drive; audible safety clutch to protect tools, pipe and machine; push-pull power from 4 to 4,000 lbs., instantly reversible; ability to work water-filled manholes; and many more.

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HEALTH DEPARTMENTS COMMENT ON HOME FOOD WASTE DISPOSERS

Results of an extensive survey of cities on the use of home food waste disposers and their effects on sewers and sewage treatment is reported on pages 82 to 85 of this issue. The following pages list reactions and comments from the States.

THE REACTIONS of a number of State Health Departments are indicated by the data below. Wherever possible, a direct quotation is made; however, some editing has been necessary to eliminate duplication, as references to use with septic tanks, and to reduce the length of the text.

With few exceptions, the states report a neutral position, neither for nor against installation of home grinders. Also, with similarly few exceptions, a considerable increase in septic tank capacity—about 50%, and for tile field 25% or more—is required. The reports from cities, presented elsewhere, are in general agreement with these requirements for septic tanks.

As with the quotation and abstracts of remarks from the city questionnaires, names have been omitted. In most cases, the replies were from the state sanitary engineer's office or equivalent.

ALABAMA—To our knowledge, no municipality in Alabama has plans to develop a program for the installation of home garbage grinders on a municipality-wide scale. We doubt that a sizeable number of homes within any one municipality is equipped with such units. Problems of sewer and sewage treatment plant operation and maintenance traceable to the discharge of materials from garbage grinders have not developed.

Should any community program the installation of home garbage grinders, we would develop recommendations for the operation and maintenance of the sewage treatment plants so affected and for capacities of the various treatment plant units. Not having any local experience or information it would be necessary that we resort to the literature for information on the subject.

ARKANSAS—We recognize the problem as one which is growing. We have requested that consulting engineers include additional digestion capacity in all sewage treatment

plant designs. In communities where grinders are extensively utilized we have noted increased solids content and, as a result, increased loading of digesters. Also, in these areas grease is beginning to appear as a problem. We do not, however, have sufficient information to ascertain that this is directly attributable to grinders but indications are that it is.

CALIFORNIA—The State has taken no position on the use of home garbage grinders. Department staff does encourage their use.

The Water Pollution Control Statutes do not require plan approval for sewers or sewage treatment plants. Therefore, only recommendations for additional plant capacity would be made if such were requested by an appropriate authority. Recommendations made would be based on estimate of probable increase in BOD and volatile solids of the sewage to be treated.

About 20 cities in California have adopted ordinances requiring home garbage grinders to be installed in new homes or in those homes being remodeled where a plumbing permit is required. We have no experience with any sewerage problem resulting.

COLORADO—Where home garbage grinders are used, additional sewage treatment capacity is required. While each case is considered on its own merits, normally the only facilities increased are those dealing with sludge digestion and disposal. We do not have specific information on the reduction in volume of refuse collected in communities where garbage grinders are used. There have been some claims made that the use of garbage grinders is responsible for increasing problems with grease in sewage treatment plants, particularly in digesters.

CONNECTICUT—The State has not taken any position concerning the installation of garbage grinders. We have, on occasion, pointed out that widespread use in houses tributary

to sewerage systems creates an additional load.

FLORIDA—The State has no objection to the use of garbage grinders. We do not advise against them except on septic tank systems where the tank sizes are unknown or small. We require only that the total volume of the tank to be increased 20% in the event garbage grinders are used. We do not make a crusade to encourage their use; nor do we feel that they eliminate all garbage.

If a community or city should have 100% installation of garbage grinders in their homes, the State would require additional digester capacity and sedimentation capacity which would probably be computed on a percent solids formula.

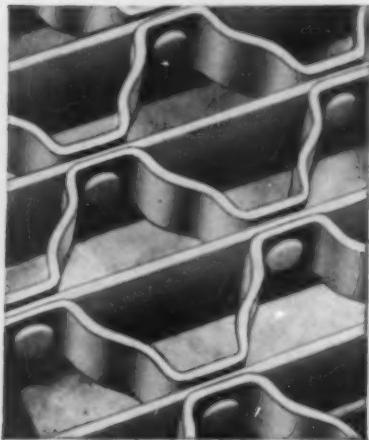
GEORGIA—For homes using individual sewage disposal systems there is a requirement for increasing the septic tank capacity by 50%, but even though this is permitted we do not encourage the use of garbage grinders and usually recommend against them. I know of no alteration of design factors in passing up on the use of disposal units for municipal systems.

I may be in error but I do not subscribe to the theory that there is great advantage to the community by reduction of volume of refuse or collection costs. If the volume reduction should be sufficient to be reflected in the garbage collection field I feel reasonably certain that the increased solids reaching the treatment plants would also be reflected by increasing problems at that point as well as in the collection systems.

ILLINOIS—The State feels that the legislature has delegated powers to municipalities and they may require or control these devices as they see fit. Where problems of exceeding the present sewage treatment plant capacities exist, we caution the affected municipality to give this consideration in the determination of their control of home disposers.

The specific increases in capacity of sewage treatment facilities depend upon the contemplated usage of garbage grinders and is taken into consideration in every design, especially when new plants are proposed. Since primary sedimentation is expected to remove an additional 35% of solids, sludge pumping facilities

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should be able to handle the increase. Biological treatment will have to assume an additional 35% organic load; such increase is taken into design considerations. In general, sludge digestion, vacuum filtration, and sludge drying will require increases in solids handling up to about 50%.

Our experiences with communities having garbage grinders are limited as we have had no serious problems except those which have been encountered by local officials in connection with house drains. Occasionally the combination of synthetic detergents and grease from garbage grinders tend to clog building drains. In a few older small plants the garbage solids impose a heavier load than was anticipated. Restaurant waste treatment units have proved to be outstandingly difficult to design and to operate.

INDIANA—While the Department has not had a specific promotional program encouraging the use of home garbage grinders, it is recognized that quick efficient disposal of garbage is a definite health benefit. We encourage their use.

Experience to date has not indicated an appreciable increase in the sewage flow from a community where the majority of homes have home garbage grinders. In checking bases of design of secondary treatment units and sludge facilities, we would expect some cushion to provide for the additional organic loading. Definite requirements have not been established.

Information available on the Jasper sewage treatment plant indicated that sludge deposits in the sewer system were not a problem. Results of surveys conducted at this plant disclosed an additional BOD and suspended solids loading and air requirements were increased. Similar experiences have been reported at the New Whiteland sewage treatment plant which serves a residential community equipped with home garbage grinders.

KANSAS—We recommend the installation of home garbage grinders for the disposal of garbage. We believe they contribute appreciably to the improvement of premise sanitation in residential areas.

Our current guide for the design of sewage treatment plants provides that the capacity for digestion should be doubled if both garbage and sewage are to be treated. The designing engineer indicates in his engineering report whether all or a part of the garbage will be dis-

charged into the sewers. We allow a proportionate reduction in additional capacity if only a portion of the garbage is treated. The secondary biological units should have 25% greater capacity if all of the garbage in the community is discharged into the sewer system. No appreciable increase in sedimentation units are required. Where digested sludge is dewatered on drying beds the area of these units should also be increased.

We do not have any detailed information relative to the effect of garbage grinders on (1) the reduction in volume of refuse collected, (2) the reduction in refuse collection costs, (3) clogging of sewers, and (4) effect on sewage treatment units.

LOUISIANA—The State has not been faced with this problem until recently when a new large subdivision with community type facilities planned and actually approved, decided to go to garbage grinders in every home. A complete redesign of the sewage treatment facilities was required to include separate sludge digestion with a digester capacity increase of 100%.

MAINE—In those communities which have sewage treatment plants, the installation of home garbage grinders has been left to the discretion of the communities in question. This department has not had any experience with homes using garbage grinders as contrasted with those in other communities which do not have such equipment so that no data has been assembled as to costs, clogging of sewers or the effect on sewage treatment units.

MARYLAND—We permit the use of these devices but do not advocate their widespread use. If a community-wide project develops we would give serious consideration to enlarging any sludge handling units such as digesters, vacuum filters, and the like at a sewage treatment plant. We have no actual requirements as we consider each project as a separate problem which should not be solved by some specific standard requirement.

We have had no experience with communities using home garbage grinders on a large scale. So far as we are aware no community in Maryland has any great number of the home garbage grinder units installed.

MASSACHUSETTS—The Department discourages the installation of garbage grinders in houses and public

schools which dispose of their sewage in septic tank-leaching field installations. Where there is a public sewerage system, the Department has taken a neutral position. The Department has not adopted any standards of design of sewage treatment plants and prefers to review each plan on its merits.

The Department is not aware of problems of the clogging of sewers or overloading of sewage treatment plants due to garbage grinders alone. We are aware of the increase in the amount of sewage and its biological and solid loadings. This is due to automatic washing machines, dish washers, garbage grinders and better sanitary habits. The eating habits of families are also changing due to improved packaging of foods. The newer types of sludge digestion, involving external heaters, draft tubes or gas recirculation and sludge thickening are being installed which provide better digestion. There is also a trend toward the installation of vacuum filtration of raw or digested sludge.

MINNESOTA — The Department neither promotes nor discourages the use of home garbage grinders. They are regarded as an acceptable means of garbage disposal. The following design criteria applies to sewage treatment works which are to receive the ground garbage from the establishments served: 25% increase in BOD; no increase in volume; 40% increase in suspended solids; and 50% increase in sludge digestion capacities.

Minnesota has but one community where garbage is disposed of on a community basis by means of home garbage grinders. The Village of Hoyt Lakes has been developed during the past decade by a mining company for its employees of a taconite operation. Garbage grinders were installed in each home and the sewage treatment works were designed for a capacity of one million gallons per day based on the criteria indicated above. To the present time the volume of flow through the plant has probably not exceeded 300,000 gallons per day. Very little can be said, therefore, as to the operational characteristics of this plant and what might be anticipated during periods of operation at maximum capacity. To the best of our knowledge there has been no special problem associated with the clogging of sewers.

In our work with individual sewage disposal systems of the septic tank-soil absorption type used by

residential establishments, we presume the ultimate use of a garbage grinder and automatic washer, and recommend that the system be designed accordingly.

MISSISSIPPI—The State has not required additional sewage treatment capacities for communities which permit grinder installations. In communities where home garbage grinders are used extensively no doubt quite a substantial increase is put on the treatment facilities and consideration should be given to increasing their treatment capacities.

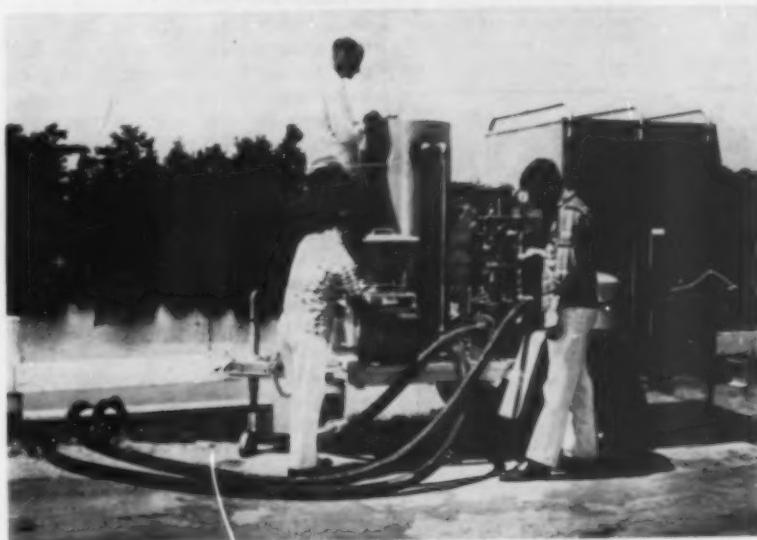
MONTANA—The State might be considered neutral, but we would be inclined not to look with disfavor upon them of a community or individual desired such an installation. We have not had this question arise in the State before, and we would probably watch a municipality where garbage grinders were being

installed so as to make proper recommendations when necessary. We have not had experiences with garbage grinders in Montana. Therefore, we cannot comment regarding the clogging of sewers nor the effect upon sewage treatment units.

NEBRASKA—The State is encouraging the use of waste food grinders. It is our opinion that this is the only practical way of disposing of waste food in a sanitary manner especially in the smaller communities where regular garbage and refuse pickup is not available. The removal of the garbage can together with its allied odor, insect and rodent nuisance is, in our opinion, justified reason for the encouragement of the waste food grinder.

The installation of waste food grinders is slow. Therefore, we have not been too severe in increasing the size of sewage treating facilities anticipating that waste food grinders

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tually serves as a pilot plant, determining the applicability, efficiency and economy of vacuum diatomite filtration—either for plant expansion to meet seasonal demand or for primary supply. Trailer, 11-ft. long by 6-ft. wide by 7-ft. high, has its own generating plant for operation of the Proportioners vacuum filter, hypo-chlorinator, pumps and body coat feeders. It can deliver purified water at the rate of 30 gallons per minute.

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will be installed. It is our opinion that with an adequately designed sewage treatment plant, the additional loading of waste food grinders should not overtax the present facilities. Should the use of waste food grinders be made universal, we would ask that facilities be increased up to 10 percent. I refrain from making specific recommendation because I believe the size and type of plant, as well as local conditions will enter into the design.

From the information we gather, there are not sufficient waste food grinders installed to present a specific pattern of sewage treatment. With the exception of Fremont, I know of no restriction that is being placed upon the installation of waste food grinders. It is my understanding that Fremont will not permit the installation of waste food grinders on the last three blocks of any lateral. Fremont has exceptionally flat sewers and has reported difficulty from sedimentation where low flows occurred.

NEVADA—There is one community in the state with a prohibition against the installation of a garbage grinder. The basis for this prohibition is that the grades of this particular sewer system are quite flat and the two or three installed in that community would result in clogging of the collection lines. On one of these lines the service was to a home served by a long run of 4-in. pipe on a flat grade. The other installation in this same town was a large hotel restaurant facility in the down town section and this caused clogging. In the Reno area there was an attempt by a hog feeding association to enlist our support in prohibiting garbage grinders in the community.

At the present time we have not observed any treatment plant not capable of handling the additional load from garbage grinders. The design criteria for plants has not had to be altered to take care of this problem.

We have observed no reduction in refuse volumes when these units have been installed but measurements of refuse are so unreliable as not to warrant a conclusion. In the Lake Tahoe area, which is a very highly developed resort area, garbage disposal is a problem. The large motels do install garbage grinders and we do have a very heavy grease load. This entire problem of the resort hotel in Nevada is so special and so extreme a problem that I would not know whether the grease is a result of the installation of the garbage

grinder or the failure to install grease traps. I have never been an enthusiast for grease trap installations but they are absolutely necessary on our large resort hotels.

NEW HAMPSHIRE—The use of garbage grinders is not believed to be widespread in New Hampshire except possibly in a few of the more recent housing developments and these are generally not within sewer areas. We believe the use of garbage grinders to be a matter of local concern. In regard to increasing treatment plant capacity, such construction is worked out with the community and their consultant when need becomes apparent. Any such needed increase in capacity to date, we believe has been due more to increased population load rather than any other factor.

NEW JERSEY—The State has no specific requirements for design of sewage treatment plants where garbage grinders are employed. There has been at least one instance where a new community contemplated wholesale use of garbage grinders and the consulting engineer made provision for additional biological filter capacity and digestion capacity. This is the type of treatment which we would expect whenever general use of garbage grinders were contemplated. In our older communities we have experienced no wholesale use of the grinders so that no issue has been made of the problem. To the best of our knowledge there have been no instances of sewer clogging or other maintenance problems which could be attributed directly to the maintenance of garbage grinders.

NEW YORK—We caution municipal officials and persons who contemplate use of garbage grinders with proposed discharge to sanitary sewers and sewage treatment plants that the added solids loads on the plant must be planned for in the design. We have not yet received any projects where a community was to be served entirely by garbage grinders discharging into the sanitary sewer system, therefore, we have not had occasion to determine the additional load we would ask for in the design.

NORTH CAROLINA—if a municipality permits or desires the populace to install garbage grinders, we recommend that consideration be given to enlarging portions of the sewage treatment plant in order to provide for the additional expected load. The effect of ground garbage

on sewage treatment can vary greatly. In general, extensive use of these devices would necessitate alterations in the design of the primary and secondary units of treatment plants, together with increased facilities for sludge digestion, gas collection and sludge handling. These enlargements would be needed due to an expected increase in solids and BOD. Scum production and sludge volume would probably increase considerably due to increased solids from the garbage and partially due to increase in solids removal efficiency that would be realized as a result of adding garbage.

NORTH DAKOTA—As you perhaps know, North Dakota is using sewage stabilization lagoons almost exclusively for sewage treatment. In calculating the loads to the lagoons, we anticipate a normal number of garbage grinder installations. Our present design standards for lagoons are based on 20 lbs. of BOD per acre per day. Naturally this loading must consider normal, below, or above average use of home garbage grinders. There has been no community-wide use of garbage grinders in any North Dakota city. We are not aware of any particular experiences or problems with community use of grinders.

OHIO—The Department has not, to date, required additional capacities of sewage treatment units where home garbage grinders are used. However, the BOD and suspended solids content of sewage (both of which are affected by home garbage grinders) are used to determine capacities of sewage treatment units needed.

OREGON—The State has no objection to garbage grinders being used in homes connected to public sewer systems or even private systems if such facilities have sufficient capacity to accommodate the additional solids loading. We definitely discourage their use in connection with individual septic tank systems or cesspools that have not been designed with additional capacity.

Thus far the use of household garbage grinders has not been extensive enough in any Oregon community to cause any special problem in the operation of either the public sewer system or public sewage treatment works. Likewise such use has had no noticeable effect upon the problem of garbage disposal. Therefore it has not been necessary to make any special allowance for ground garbage in the design of

public sewage treatment works in Oregon.

PENNSYLVANIA—Where a community plans to install home garbage grinders, we require additional capacity in the sewage treatment works with respect to biological treatment and solids disposal, but no fixed amount has been adopted for this allowance. No additional

requirement is applied for sedimentation capacity. With properly designed sewers there has been no difficulty with clogging. In one instance the increased quantity of sludge necessitated the expansion of an already overtaxed sewage treatment plant. It might interest you to know that the Allegheny County Sanitary Authority, serving a very large population in the Pittsburgh area,

PLASTIC SKIN FOR A RESERVOIR



A NEW use for vinyl plastic material has been developed in a reservoir constructed on the edge of the Mojave desert near Lancaster, California. Designed for 2,000,000 gallon capacity, the new plastic reservoir supplies water for a section of this growing Southern California community. It has been lined with Koroseal plastic sheet at an estimated savings of about \$5,000 over conventional construction methods.

The idea of using plastic in reservoir construction was proposed by R. G. Lunt, manager of the Waterworks & Utilities Division, Department of County Engineers, Los Angeles. Working with the plastics department of B. F. Goodrich Industrial Products Company, the techniques were evolved for using a 21,680 square foot lining of vinyl plastic sheet. Fabrication of the huge sections of plastic, covering over one-half acre, was handled in

Los Angeles by Electroseal Plastics. The methods of using the plastic sheet were similar to those employed recently in plastic-lining large swimming pools.

Installation of the liner involved special technique to handle the 4,000 pounds of material which had been pre-fabricated in one sheet. The reservoir, measuring 220-ft. long, 77-ft. wide and about 20-ft. deep was excavated with sides sloping at 45 degrees. The liner was laid over the bare, pre-tamped earth to serve as the sole retainer for the 2,000,000 gal. of city water.

Folded something like a long road map, the sheet was laid down the middle length of the reservoir floor then pulled up the sloping sides by workmen standing around the rim of the reservoir. The edges were then sealed water-tight against a 7-ft. wall surrounding the reservoir to give a maximum water depth of 26 feet.

has levied an extra charge of 50 cents per month for sewer service for those homes equipped with garbage grinders.

RHODE ISLAND—The prevalence of home grinders is not great enough to affect required capacities of sewage treatment plants nor to provide experience regarding clogging.

SOUTH DAKOTA—Consideration is given to the additional load on sewage treatment facilities in communities which permit installation of garbage grinders, the extent depending on local conditions. Plant designs which are based on actual sewage characteristics can readily take into account the extra load resulting from garbage grinders. In general, additional capacity needs to be provided primarily in the solids disposal section of the treatment works.

Our office has had no experience with respect to communities using garbage grinders so far as the volume of refuse collected and in the relative refuse collection costs. We have heard some instances where clogged sewers have been attributed to the increase use of garbage grinders; however, there are no documented experiences of this type in our files. There have been reports of additional solids causing problems with the operation of sewage treatment units, but again there is no documented evidence and data on these experiences.

To date, none of our cities have gone to a complete garbage grinder installation program and no surveys have been conducted.

TENNESSEE—The State knows of no cases yet where the total load has been affected. Relatively few units are in use in Tennessee and no information is available to us.

VIRGINIA—The State does not concern itself to the extent of advising on the use of garbage grinders. This is a personal problem and may be entirely on a local basis. At this writing the installation of such grinders has not been a material problem; however, there are some plants located in North Virginia constructed within the past ten years which made provision for handling of the garbage grinder waste. The sludge digester capacity was increased above the minimum normal required; also the organic loading on the plants was increased to 0.28 pound per capita.

We have no experiences concerning the use of garbage grinders which would reflect on sewer maintenance or on decrease in refuse

collected resulting in reduction of refuse collection cost. We know of no particular plant that has experienced any unusual difficulty specifically due to use of garbage grinders.

WEST VIRGINIA—The State recognizes that home garbage grinders will be used and has raised sewage treatment plant requirements sufficiently to accommodate their use. The extra load would require roughly 50% or more additional sludge digestion capacity.

We have had the problem arise at one sewage treatment plant. A large resort hotel had eliminated its garbage dump and all garbage was to be ground up and discharged into the sewers. This started in the fall of the year. By the next summer the sewage treatment plant—which was located in the golf course area—was an odorous mess. Upon our being called in, we found the Imhoff tanks sludge digestion compartments practically full of undigested or green sludge. There was a thick green scum floating on the gas compartments. The sludge drying beds were full of undigested and odorous green sludge.

After an inspection of the plant to determine the cause of the operation failure it took little persuasion to stop the grinding and discharging of the garbage into the sewers.

Answers Received Late

ARIZONA—There have been no community projects for disposers and the total of individual installations is not known. A study by the Sanitary District No. 1 of Pima Co. was reported. Two sections in Tucson were selected having about the same area and with homes in the same price class. In one section all homes had grinders, while those in the other section did not. Sewage flow from each section was measured. The flow from the area having the home disposers was slightly less than the flow from the other section.

IOWA—There has been no problem with organic loadings at sewage treatment plants due to the use of home disposers. Increased problems with grease are reported, as well as deposition of solids in sewers having flat grades. However, it is not stated that these troubles are caused by garbage grinders.

MICHIGAN—We recognize that the use of home garbage grinders imposes a substantial additional organic load on sludge treatment and disposal units, and on secondary

processes such as trickling filters and activated sludge. We do not have any dependable information indicating the precise effect of these loads. We have noted, however, that in communities where a very high proportion of home garbage grinders are installed, there is a substantial increase in organic loading on treatment units as measured by BOD and suspended solids and that there is generally a substantially larger amount of grease accumulations on the settling tank units. It has been our general practice for the past several years to require additional capacity in sludge handling facilities and aeration units based on the number of home garbage grinders anticipated during the design period of the plant.

NEW MEXICO—Additional digester capacity is required and figures 50 percent of the homes to be the maximum equipped with grinders. However, a recently planned development which was expected to have all homes so equipped, was required to provide 50 percent added digester capacity, or 4½ cf/cap heated.

SOUTH CAROLINA—No restrictions are placed on the installation of garbage grinders. Septic tank disposal systems are designed for this possible added load. Minor clogging of home service lines has been reported.

TEXAS—No specific requirements have been issued for extra waste treatment plant capacity where home disposers are used, but additional capacity is strongly suggested in all phases of the plant.

WISCONSIN—Experience in the universal use of home disposers is limited, increased capacity is required where they are installed—up to 75 percent increase in sludge digestion and similar increases in oxidation units.

• • •

An International Water Supply

In order to serve Altona, Manitoba, with water, Neche, N.D., is extending its water lines across the US-Canada border, a distance of some 10 miles.

Street Lighting Activities of a County

A program for street lighting in all new subdivisions has been carried on by Montgomery County, Md. At the end of 1959, the County was maintaining more than 14,000 street lights.

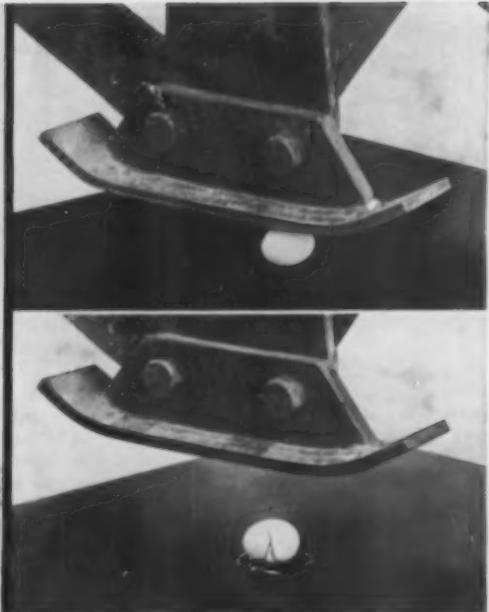


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**BUCYRUS
ERIE**

THE
**INDUSTRIAL
WASTE
DIGEST**



Prepared by CLAYTON H. BILLINGS, Associate Editor

**Metal Finishing
Wastes and ORP**

The construction of modern military aircraft requires a multiplicity of process methods and the resulting industrial wastes may contain almost any type of contaminating substance. At the waste treatment plant for the Wichita factory of Boeing, completed in 1957, the wastes are reduced, precipitated and then oxidized. The reduction reaction is carried out at pH 2.5 using sulfur dioxide. Oxidation occurs at pH 8 using both ozone and biological oxidation. The waste flow, about 4 to 5 MG per week, enters grit and oil separator pits and then overflows into holding tanks. A stirred reaction tank follows where the pH lowering occurs by automatic control of a sulfuric acid dosage. Ferrous sulfate and sulfur dioxide are then added, the latter automatically adjusted according to ORP values. The effluent is discharged to a solids contact unit for automatic pH adjustment to 7.4 using recirculated lime slurry. Caustic soda, coagulants and coagulant aids can be added at this point, precipitating chromium hydroxide. The waste stream is discharged to a surge tank where it is mixed with a chrome-free waste from the manufacturing plant. The mixture is recarbonated by submerged combustion and is pumped to an ozone absorption tower where a pH of 8 is maintained by the addition of an alkali. Treatment follows in a solids-contact unit for precipitation of heavy metals using coagulants at a pH of 8.5. Recarbonation and a third solids-contact basin are used for further removal of solids at pH 7.5 in the presence of anaerobic sulfate-reducing bacteria. The final step is recycling the waste over a tower for oxygen absorption. Sludge from the solids contact basins is dewatered by a vacuum filter and is then hauled to a sanitary landfill.

In applying ORP control of the sulfur dioxide reductant, difficulty was first experienced because of no provision for a lower limit control of pH. At a low pH, sulfur dioxide acts as an acid lowering the pH even further below the set point. This in turn created an increase in ORP, and accordingly the control system continued to add sulfur dioxide. To correct this, a double-ended pH control system was installed, using caustic as well as sulfuric acid, and pH electrodes actuating pneumatic signals. For removal of the last 10 mg/L of hexavalent chromium, it is believed that a process analyzer is required which would detect low concentrations.

"Control of Metal Finishing Wastes Using ORP." By B. T. Hulse, R. P. Slem and G. E. Summers, respectively Chemist, Chemical Engineer, Wilson and Company and Industrial Water Service Engineer, Boeing Airplane Co. *Journal Water Pollution Control Federation*, September, 1960.

**Sulfuric Acid
Mist Formation**

Sulfuric acid can be produced in atmospheric fogs when sulfur dioxide and the nuclei of oxidation catalysts are present. Manganese and iron catalysts often occur in the atmosphere as small particles of ash from the combustion of coal and fuel oil. Laboratory experiments were set up to obtain quantitative data on this phenomenon. Simulated fogs were formed by expansion of moist air in the presence of sulfur dioxide and manganese, iron and sodium salt nuclei consisting of micron-size particles. Humidity was controlled. Measurements were made of the degree of oxidation of sulfur dioxide, the concentration of sulfuric acid formed and the time of reaction. The concentrations of sulfur dioxide used corresponded to the concentrations in gases resulting

from the combustion of sulfur-bearing fuels after diluting 10 to 1000 times with air. The conditions of exposure in the fog corresponded to the persistence of plumes from stacks discharging gases into winds of 2 to 10 mph. When manganese sulfate or ferrous sulfate nuclei were present, significant concentrations of sulfuric acid up to 50 mg per cu. meter were formed within a few minutes. The fastest rate occurred at relative humidities just under 100 percent.

"Formation of Sulfuric Acid in Fogs." By H. F. Jonstone and A. J. Moll, University of Illinois. *Industrial and Engineering Chemistry*, October, 1960.

**Can Oxidation
Be Total?**

A study was undertaken early in 1958 with the primary objectives of 1) determining limitations of the total oxidation process as applied to waste treatment, 2) demonstrating the hazard involved in applying batch experimental data to the design of full-scale continuous bio-oxidation units, and 3) showing the inconsistency of the concept of destruction of biological solids in total oxidation units. Both batch and continuous completely-mixed bench-scale biological oxidation units were constructed, each with a mixed liquor volume of 5.5 liters. The substrate used was glucose supplemented with nitrogen and phosphorus in a solution of tap water. The systems were operated without intentional solids wastage. The results of a year's operation showed that both systems consistently produced effluents with median BOD values less than 10 mg/L even though the continuous unit operated at loadings up to 30 times higher than the batch unit. No food-population equilibrium was attained in either system at one substrate loading for as long as 103 days. The solids in the batch unit accumulated



**"Mr. Kent, what
do you consider
the toughest
problem in
pumping raw
sewage?"**

**"Turkish
towels!"**



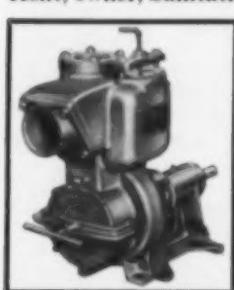
End Plate off



Towel out



End Plate on



*Model 14A2-B
Sewage Pump*

PUBLIC WORKS for November, 1960

"Towels can jam the works, but good!" says Cecil Kent, owner, Sanitation Service Company, Jacksonville, Florida. "I've had 'em clog conventional pumps so bad, it meant a shutdown from two hours to two days.

"That's why I've standardized on Gorman-Rupp sewage pumps. And what a difference! Fewer shutdowns...clogging cleared in just three to fifteen minutes! This cuts average

maintenance costs from \$120 to only \$12 per pump per year. On my 21 Gorman-Rupp pump installations, that adds up to a whopping big saving. Over \$2200 a year on parts, packing, materials, and labor.

"Sure, I had a problem—but *no more!*"

Thrifty, trouble-free, self-priming Gorman-Rupp sewage pumps—2", 3", 4" or 6" sizes—can be connected to your power or ordered complete with power units. Write for complete specifications.

THE GORMAN-RUPP COMPANY

305 Bowman Street

Gorman-Rupp of Canada, Ltd., St. Thomas, Ontario

Mansfield, Ohio

continually and eventually changed in character, emphasizing the impracticability of applying bench-scale data on batch-fed systems to the construction of continuous full scale units. Some build-up of solids occurred in both units and appeared inevitable unless effluent carry-over was sufficient to balance the system. Total oxidation units appear to be feasible for small plants, particularly where dilution is available, but consideration of the process for large industrial waste treatment installations is hazardous.

"Food-Population Equilibria in Bench-Scale Bio-Oxidation Units."

By A. W. Busch and Nugent Myrick, The Rice Institute. *Journal Water Pollution Control Federation*, September, 1960.

Combined Industrial Domestic Waste Plant

The new Link-Belt roller bearing factory near Indianapolis built its own combined industrial and domestic waste treatment plant. The wastes from manufacturing, amounting to 30,000 to 60,000 gpd, consists primarily of detergents and other cleaning agents, grinding and cutting oils and nitrate salts. The

domestic sewage flow from the offices and plant is about 4½ times as much. The drainage system was designed to segregate the industrial and domestic wastes so that the former could be pretreated. Pretreatment is accomplished in three batch operated tanks, provided with skimming, mixing and sludge draw-off facilities. Scum is removed to oil holding tanks where it is salvaged for use as boiler fuel. Each batch is subjected to jar tests to determine the best treatment. Normally the wastes are alkaline oily material, calling for treatment by sulfuric acid, alum and a nonionic polyelectrolyte. If water soluble oils are present, soda ash and lime are added prior to regular treatment. After mixing and settling, the effluent is mixed with domestic wastes and treated in a biofilter plant. Sludge from the batch tanks is discharged to lagoons. The combined waste treatment plant includes primary and final settling, trickling filters in series, comminution and digestion facilities. The effluent from the final settling tank is pumped onto a slow sand filter and is chlorinated before release to the wastewater.

"Industry Solves Its Own Sewage and Process Wastes Treatment Problem." Larry C. Geyer, Link-Belt Co. *Wastes Engineering*, September, 1960.



The Good Samaritan

We lay no claim to exclusive virtue, nor any patent rights on high moral principles. But we humbly endorse the "Golden Rule" because we have seen the effects of its application to our own business.

Years ago as a struggling new foundry, M & H designed and made a better valve and hydrant. Then, and many times since then, we received most valuable help and encouragement from water works men, engineers and public officials. From the beginning, service-to-the-customer was an M & H watchword. But the reverse—customer-service to the Company—voluntarily and without obligation, surely was a practical application of the "Golden Rule."

These customer "good Samaritans" have stayed with us through the years. They have given us many a lift along the road down which has come today's product. Engineering and foundry research has proved many of their suggestions worthy of adoption—thus helping us to design and manufacture the world's best valve and hydrant.

This customer good-will has been, and is, a human and inspiring phase of M & H steady growth into a position of leadership in the water works industry.

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AND FITTINGS COMPANY**
ANNISTON, ALABAMA

Adsorption of Sulfur Dioxide Emissions

The possibility of using dry ion exchange resins for adsorption of sulfur dioxide in industrial emissions to the atmosphere was investigated. Among the materials studied were cation exchange resins and chloride forms of anion exchange resins. Air-sulfur dioxide mixtures were passed through the resins at various temperatures until no further increase in weight of the resin was discernible. The procedure was repeated for several different concentrations. It was shown that anion exchange resins will adsorb up to 50 percent of their weight of sulfur dioxide. The IRA-400 anion exchange resin (chloride form) appeared to compare favorably with silica gel, activated charcoal and molecular sieves in performance at 25° and 100°C.

"Adsorbing Sulfur Dioxide on Dry Ion Exchange Resins for Reducing Air Pollution." By Robert Cole and H. L. Schulman, Clarkson College of Technology, *Industrial and Engineering Chemistry*, October, 1960.

Equipment Needs Special Care In the Winter

REAGARDLESS of whether you plan to use it or put it in storage until next spring, your equipment needs special care during the winter months. Cold weather conditions create additional service problems for almost all types of equipment, and a sound winter productive maintenance program has to be well planned to allow for these problems. There are five general areas that require extra special consideration for winter operations—lubrication, cooling system, starting system, fuel system and electrical system. These same areas must also be cared for if storage is planned.

Lubrication: As temperatures settle to the lower ranges, lighter weight oils must be used. At below freezing temperatures, the engine crankcase should be filled with SAE No. 10 crankcase oils. The lower viscosity oil permits easier cranking of the engine and is fluid enough to circulate freely during the warm-up period. During periods of extremely cold weather, or in climates of constantly low temperatures, it may be necessary to dilute the oil with kerosene in order to provide sufficient viscosity. When temperatures rise somewhat, however, the diluted oil should be drained and the crankcase refilled with undiluted oil, since too-thin oil will not give proper lubrication in warmer weather. Lubricant used for bearings must also be changed to a lighter grade for cold weather, with No. 1 or No. 0 normally the most successful. A grade of at least No. 80 transmission oil is recommended by Caterpillar Tractor Co. when temperatures drop below freezing. As with the crankcase oils, it may be necessary to thin this oil with kerosene during extremely cold weather periods. Again, however, the oil should be changed when warmer temperatures return.

While of great importance during warm months, lubrication of track and carrier rollers becomes even more important in cold weather operations. Except for lifetime lubricated rollers, which require no field lubrication, it is generally necessary to switch to lighter grades of lubricants during sub-zero weather. In some instances it

may be necessary to use oils in place of grease. The ability of the standard grease gun to handle the grease outdoors is a good general guide as to when it is time to change to lighter grades, or switch to a crankcase or transmission-type lube oil. Track-type tractors equipped

becomes necessary to heat the crankcase with a torch or some other form of high heat.

Cooling System: The onset of cold weather makes one think immediately of putting anti-freeze solutions in his auto. The same care applies to equipment engines. With diesel



Courtesy Caterpillar Tractor Co.

● SNOW REMOVAL is hard on equipment, both from the nature of the work and from the long hours of continuous operation. Good maintenance is essential.

with lifetime lubricated rollers or idlers in good condition do not require refilling even in the coldest weather since they are filled with a low viscosity lubricant during factory assembly. They are refilled only at the time of rebuilding.

Starting: For machines equipped with gasoline starting engines, cold weather starting normally presents little difficulty, if both the gasoline and diesel engine are in good shape and the necessary precautions regarding lubricants have been observed. Diesel engines depending on either electric or air starting systems, however, are sometimes difficult to start without some additional help in temperatures generally below 50 degrees F. The solution in these instances generally is to use additional external heat, such as a manifold air heater or other starting aids. In extreme situations, such as Arctic conditions, it often

engines, it is advisable to use permanent-type anti-freeze solutions because of their higher operating temperatures. Although some operators prefer to use water only as a coolant and drain the block and radiator at the end of each day, it is a risky business. Failure to drain out the water just one time can result in expensive damage to the engine.

Fuel System: While considering the possible damage caused by water freezing in a diesel engine, it should be kept in mind that the fuel system can also turn up trouble because of water. The best means of keeping water out of the fuel system is to prevent condensation inside the fuel tank. This is possible by filling the tank completely at the end of the workday to push out the moisture-laden air. Much of the water that still gets into the system can be removed by draining off a

small amount of fuel each morning. The fuel filter housing of Caterpillar diesel engines has a sump which traps any remaining water carried in the fuel. During cold weather the fuel filter housing should be drained at regular, short intervals to prevent accumulated water from freezing and possibly cracking the housing. Other points to be considered for cold weather operation are: the type of fuel used, the general condition of the electrical system and the care given the battery. For sub-zero operation, a fuel having an unusually low pour point should be used to insure proper flow of fuel from the tank to the fuel transfer pump. These are often called "winter grade" fuels and are available in most cold areas.

Electrical System: Before cold weather has arrived, the entire electrical system should be checked over . . . especially the starting engine magneto. For units fitted with direct electric starting only, particular attention should also be given to the battery. This should be tested frequently and charged whenever the charge drops below standard in order to insure sufficient power for starting. A discharged battery should never be exposed to freezing temperatures as the electrolyte can easily freeze, causing the battery case to break. A strong battery is especially important in cold weather since a battery's "cranking ability" drops quickly in cold weather and at the same time, the "drag" or inherent engine resistance increases rapidly. This means the battery has less energy to do a more difficult job.

Air Cleaner: Oil bath type air cleaners should receive even more careful attention during cold weather. As temperatures drop, oil in the air cleaner cup may have to be changed to SAE 10 weight in order to be carried up into the screens. If the oil does not reach and coat the screens, the efficiency of the cleaner drops considerably. When equipment is operated in blowing snow, the air cleaner should be checked frequently since the cleaner or its inlet may be plugged quickly. Dry type air cleaners require no special attention in winter operation other than frequent checks against plugged inlets.

Equipment Storage: The great danger to guard against in storing equipment is rust, both internal and external. Preventing its formation is of the greatest importance. Equipment to go into storage should be first thoroughly lubricated, then completely washed, followed by

spot painting of exposed metal surfaces. Bulldozer blades, cutting edges, moldboards and other external surfaces not repainted should be coated lightly with grease to protect them from rust and corrosion. The cooling system should be protected by filling with a permanent anti-freeze solution that contains a rust inhibitor. If the engine is to be stored with a drained cooling system, however, a soluble oil-type rust inhibitor should be added to the coolant during the last week of operation. This allows a film of oil to spread throughout the inner surfaces of the cooling system and provides a coating against rust. If possible, however, it is best to store machines with permanent-type anti-freeze so that the engine can be turned over at weekly intervals without requiring special preparations. Crankcases, transmission cases and final drives should be cleaned, flushed and refilled with new oil before storing machines.

If possible, machines should be started once each week and the

engine allowed to run several minutes. Also, on track-type tractors, it is advisable to run the machine forward and backward several times in order to redistribute the oil in the transmission and final drives, recoating all interior parts. Under circumstances where it is not possible to operate the engine or machine on a weekly basis, it is advisable to add a cupful of oil in the top of each cylinder (less for small tractors and engines). Rubber-tired units should be blocked up, if possible. If blocking is not practical, it is important to be sure that proper tire pressure is maintained throughout the storage period.

Above all else, however, before preparing equipment for winter storage, it is essential to read the operator's handbook for each machine involved. Proper precautions taken before winter arrives will assure each owner that his machines will be ready for operation when the full work season next gets underway.

Outdoor Lighting for Miami Airport



OUTSTANDING among the innovations at the handsome new Miami International Airport are outdoor lighting features provided for users of both aircraft and ground transportation. Overhead lighting in the huge auto parking area and loading aprons for planes includes some specially designed units, never before installed in any airport. Functional, as well as decorative, these installations provide clear visibility with a minimum of glare, and employ powerful, long-life fluorescent and mercury light sources. General Electric's Power Groove fluorescent lamps provide lighting for the service areas on each side of six terminal fingers extending from the central terminal

building. The lamps are mounted, in pairs, in fixtures supplied by Pfaff & Kendall. These units supply comfortable but effective illumination for airline passengers entering and leaving the 84 gate positions, and for the aircraft crews. At the mammoth automobile parking area across from the terminal entrance the lighting is accomplished by use of 400-watt, color-improved mercury lamps. Well-distributed illumination here facilitates the safe movement of traffic and aids pedestrians in making their way to and from the terminal building. Maurice Connell & Associates were the airport lighting engineers. Rader and Associates were design engineers for the parking areas.

Municipal Power

Peaking and Standby Power Capacity

BRUCE J. ENNIS

Principal Engineer,

Burns & McDonnell Engineering Co.
Kansas City, Missouri

IN THE AVERAGE electric generation and distribution system, the loads imposed on the central station generating equipment by consumers is constantly varying, from hour to hour during the day, from day to day during the week, and from month to month during the year. The peak system demand is greater at 2 o'clock in the afternoon than it is at midnight. Sundays, with predominately residential and limited commercial loads, require considerably less generation than do Tuesdays and Thursdays when a city's industrial demands are experienced in full measure. December in the northern sections of the country, and August in the air conditioning belt, impose greater demands on plant generators than those experienced during April or September.

In general, daily load peaks, during which the kilowatt demands rise sharply above the average basic level of the fluctuations in the daily load cycle, persist for only a few hours per day. Although such peaks may represent a considerable magnitude in kilowatts of power, their duration is so short that the energy in kilowatt-hours required to serve peak loads is relatively small in proportion to the total base load energy generation requirements.

Under such conditions, the supply of peaking power capacity could be in the form of low cost generating units, for minimum capital costs and annual fixed charges, even at some possible sacrifice in efficiency. In other words, peaking generating units should produce power in kilowatts at the lowest possible investment cost. Since the required amount of energy generated in kilowatt-hours by peaking units is small in comparison with that produced in the higher cost and somewhat higher efficiency base loaded generating units in the plant, it is not quite so essential that the heat

rates and fuel costs of peaking units be as low as those of base load units.

The power supply for an electric utility system must be adequate to supply at all times the peak demand on the system as it occurs. To achieve this adequacy, the power supply system must have a "firm" capacity equal to or exceeding the peak demand. Firm capacity may be defined as the total power supply capacity minus that of the largest generating unit or power source on the system, which may be temporarily out of service for any reason such as inspection, maintenance, or unit breakdown. In case the system demand is greater than the firm plant capacity, additional standby capacity should be provided for the deficiency in power generating capability.

In the interest of over-all economy in system operations, the ideal standby generating unit, to be operated and to serve in lieu of another plant generating unit which is temporarily out of commission, could be in the form of a low cost generator with minimum fixed charges as described above for peaking units.

On this basis, a given plant's peak ing power capacity requirements and standby power capacity requirements could be combined in a relatively low cost generating unit to serve strictly as an auxiliary to high efficiency base loaded generating units in the plant, such as steam turbine generator or slow speed diesel engine generator units.

In peak load and standby power service equipment, consideration might be given to two general types of units. These are: (a) Simple cycle gas turbine generator units using gas and/or oil fuels; or (b) internal combustion high speed diesel engine generator units using oil and/or gas fuels.

Both types of units can be equipped with self-contained starting equipment to serve as integral plant start-up units as well as for peaking and standby service. Combustion gas turbine units are capable of assuming full load within 20 to 45 minutes from a cold start, and diesel

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engine drive units can be put on the line at full load within 1½ minutes.

Units for this type of service have comparatively low initial costs, and require very simple foundations and housings. They do not require a large water supply; therefore, their installed cost is likewise low, resulting in the very minimum of investment costs to be charged against the amount of prime power generated.

Peaking and standby generating units are commercially available in many nominally sized ratings. Typical gas turbine generator simple cycle units have kilowatt ratings ranging from 5,300 to 20,500. High speed diesel engine generators using diesel fuel are available in 2,000 to 10,000 KW ratings, while gas fuel diesels have 1,000 to 4,000 KW ratings.

In order to present representative data regarding the annual costs of supplying peaking and standby power with typical units described above, a brief and approximate study has been made under the following general assumptions: a) Annual generation equivalent to 1200 hours use of capacity; b) Fixed charges at 7% of investment; c) Gas fuel at 20¢ per million Btu; d)

Diesel fuel oil at 15¢ per gallon; and e) Nominal incremental labor as an adjunct to the main station labor forces.

2000 kw Diesel Unit

Annual Costs:

Fuel	\$25,200
Other	12,000
Fixed Charges	18,400
Total	\$55,600
Mills/Kwh	23.1

10,000 kw Diesel Unit

Annual Costs:

Fuel	\$126,000
Other	24,200
Fixed Charges	75,600
Total	\$225,800
Mills/Kwh	18.8

20,500 kw Gas Turbine Unit

Annual Costs:

Fuel	\$106,400
Other	22,000
Fixed Charges	188,100
Total	\$316,500
Mills/Kwh	12.8

Obviously, the figures listed above must be considered in a very general sense, only. The approximate costs shown will vary considerably among individual utility systems

depending on actual fuel costs, fixed charges, the size and type of units desired for peaking and standby service, the coordination of proposed peaking units with existing and future base load units, the annual number of hours use of peaking capacity required (which might be considerably less than, or somewhat more than the 1200 hours used in the examples), and related matters. The type of additional peaking and standby power capacity in a given plant will depend on the interrelation of all of these factors.

* * *

Transits and Levels in Texas

At last count, says "Texas Highways," the Texas Highway Department owned 2,200 levels and transits. Cleaning and repair is provided by a special 7-man section.

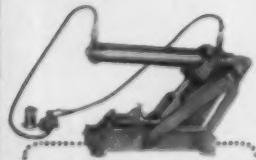
Sanitary Landfill for a County

One sanitary landfill is operated by Montgomery County, Md. This is near Rockville and in 1959 commercial haulers delivered 44,000 loads of trash to it. A nominal charge is made for disposal of commercial refuse, but no charge is made to individuals. M. A. Butcher is County Director of Public Works.

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The Trojan combines pushing and pulling operations in one machine—eliminates all time-killing resetting of grip—keeps pipe continuously moving. Does the job at lower cost—in far less time.

Model A weighs 65 lbs.—requires only 5' trench. One man can easily install the average service. 15 tons of pushing pressure possible. Also available for 1½" pipe.

Model B (either manual, hydraulic or air powered) needs only a 6' trench—has 3 speeds for different soils—is reversible in 30 seconds. Push pipe comes in 30' lengths, assures straight travel.

Another MONARCH CONTROL READY FOR SNOW PLOWING



Right, George Rody,
Greenfield Motors
Left, George Folk,
Folk Standard
Service Station,
both West Allis,
Wisconsin

RT-10 RIDE
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RT-10 JAC
RT-10 FOR JEEP
Fan Belt Driven

Wisconsin folks know what winter means!

Experienced operators depend on Monarch for snappy snow plow operation. Raise and lower snow plows automatically!

That's why George Rody of Greenfield Motors recommends the Monarch Power Hydraulic Control to George Folk of Folk's Standard Service in West Allis.

Winter won't wait for the plow that's late. Get Monarch now, and keep that date ...

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Deere Day in Dallas

The recent "Deere Day in Dallas" marked the first time in the history of Deere & Company that the entire sales organization was assembled in one place. Sales personnel and dealers from the U. S., Canada, and 15 other countries, were in attendance at the meeting and equipment display in Dallas, Texas. As part of the display, a model showroom and service shop were set up to provide dealers with a look at Company recommendations on ideal store and shop layout. More than \$2-million worth of John Deere products were exhibited, including 126 John Deere tractors and 223 pieces of machinery.

Industrial tractors in the John Deere line have been designed for earthmoving, logging, landscaping and material handling. Offered for use with John Deere Industrial units are scarifiers, winches, backhoes, log arches, fireline plows, cable plows, dozer blades, scrapers, mowers, snow plows and loaders.



Koehring Equipment Show

Construction machinery rivalling the spread for a major expressway project went into action recently at Koehring Company's proving grounds west of Waukesha, Wisconsin during the 1960 Construction Equipment Show staged for contractors, distributors, and other equipment users. Some 40 construction machines formed the equipment spread which included a highway paving set-up, truck crane, front-end loader attachment, trenching machine, concrete batching plant, backhoe and a variety of other machines.

Cooperating in presenting the Koehring 1960 show were these company divisions: Buffalo-Springfield Co., Springfield, Ohio; Flaherty Mfg., Pocatello, Idaho; C. S. Johnson Co., Champaign, Ill.; Koehring Division and Koehring Export Division, Milwaukee; Koehring-Waterous, Ltd., Brantford, Ont.; Kwik-Mix Co. and KAMO Tools, Port Washington, Wis.; and Parsons Co. and Shawnee Mfg., Newton, Iowa.

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says John Zablotny
Supt. of Highways,
Cheektowaga, N. Y.

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and gives us better roads.**

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The Bump at the Bridge

(Continued from page 81)

compaction standard for field compaction control.

Care must be taken not to accept too low a standard. Many of the existing compaction standards and specifications were formulated before the advent of the limited access, high-speed highway with axle loads exceeding 25,000 lbs. and the traffic intensity unlimited. A compaction standard, applicable to present day service conditions and representative of the potential of modern compaction equipment, must be used. If conditions allow, relationships between moisture, density, and compactive effort more representative of actual conditions may be established by the use of field compaction test strips.

A compaction standard, more representative of present day conditions, is known as the Modified AASHO test. The modified test, developed by the Corps of Engineers, uses an appreciably higher compactive effort than the more widely standard compaction test. Embankment compaction from 90 to 95 percent of the maximum Modified AASHO density will minimize the effects of the consolidation or densification of the usual embankment materials or abutment backfill, as well as insure good supporting characteristics of the sub-grade embankment soils.

To prevent subsidence, granular soils—particularly abutment backfill—must also be compacted to rigid specifications. Adequate protection against post-construction densification will usually be provided by compaction to about 95 percent of the Modified AASHO Standard. The compactive effort required to prevent detrimental densification or consolidation, is, however, somewhat dependent on the characteristics of the fill material and its position within the embankment; a higher density of the embankment fill directly supporting the pavement section is desirable.

Coordinated Design

The type of bridge design and the construction schedule of the pier and abutment foundations must be coordinated with that of the approach embankment. For example, if bridge piers are constructed while an approach-embankment fill is actively settling, the piers may be caused to subside unevenly under the influence of the embankment fill. Similarly, a pile-supported abutment may be "dragged" down

by the action of a settling approach fill penetrated by the piles. The choice between a simple or continuous span bridge can also be critically influenced by the foundation conditions. For example, if appreciable differential settlement cannot be economically avoided, the construction of a continuous span structure could prove disastrous, whereas a simple span bridge could undergo appreciable differential settlements without structural distress.

Field Control

Unless adequate coverage and knowledgeable field supervision are present the best design is at the mercy of the usually honest, but sometimes uninformed, contractor. Good field control is especially necessary for the success of embankment pre-consolidation methods, and for the use of designs employing excavation of compressible foundation soils. To assure that the construction is at all times according to design standards, the supervising engineer must be familiar with the design analysis and field control methods, as well as the letter of the specifications. Under circumstances requiring special foundation treatments, he must have access to a materials laboratory, and to personnel skilled and experienced in the installation and maintenance of the field control system.

Conclusion

Warped or cracked pavement, so common to our highways at bridge approaches, is largely the result of differential settlement between the bridge and the approach embankment and is generally attributable to consolidation of the bridge foundation and approach embankment soils. Smooth, durable, bump-free approach pavements depend upon: 1) Competent analysis, 2) coordinated design and 3) thoroughly supervised construction of approach embankments, abutment backfill, and bridge foundations.

Although competent soil engineering attention to these three phases of bridge design and construction would cost only a small fraction of the over-all construction costs, it is often entirely overlooked or given little consideration. A successful and economical design cannot usually be derived from the foundation investigation which consists of un-supervised borings, a few identification tests on disturbed samples of the foundation soils and by a foundation design based on an in-

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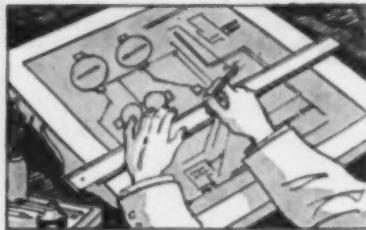
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interpretation of "blow counts". Criteria governing placement of embankment fill, abutment backfill or bridge foundations must not be taken directly from a set of standard specifications, but must be written so as to consider the individual character of the materials encountered. Finally, even the most careful attention to all factors influencing the bridge approach fill unit will not produce a smooth, durable roadway unless the field supervision is competent and effective.

• • •

Manager-Engineer Duties

(Continued from page 111)

ough Engineer, building inspector, street commissioner and zoning officer.

He attends all meetings of the Borough Council and of its committees, with the right to take part in the discussion and receives notice of all special meetings of Council and of its committees. He prepares the agenda for each meeting of Council and supplies facts pertinent thereto. He keeps the Council informed as to the conduct of Borough affairs and submits periodic reports on the condition of the Borough finances. As soon as possible after the close of the fiscal year he must submit to Council a complete report on the financial and administrative activities of the Borough for the preceding year.

The Manager sees that the provisions of all franchises, leases, permits and privileges granted by the Borough are observed. He may employ, with the approval of Council, experts and consultants to perform work and to advise in connection with any of the functions. He attends to the letting of contracts and supervises the performance of the contractor except as such duties are expressly imposed upon some other Borough officer by statute. He sees that all money owed the Borough is promptly paid and that proper proceedings are taken for the security and collection of all the Borough's claims.

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As Purchasing Officer of the Borough, he purchases all supplies and equipment for the various agencies, boards, departments, and other offices of the Borough in an amount not to exceed \$200 without the consent of Council. He also issues rules and regulations, subject to the approval of Council, governing the requisitioning and purchasing of all municipal supplies and equipment.

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In case of his illness or absence from the Borough, one qualified member of his staff is delegated the duties of the Manager during his absence. The person so designated may not perform these duties for a period longer than two weeks without the approval of Council.

As engineer for the Borough, he must give warrants of survey for new buildings and curb and gutter construction. He lays out, designs and supervises all new street and storm sewer construction; he provides the engineering services for the Borough Authority which handles the water plant and water and sewer systems.

1960 Income and Expenses

The budget for the year 1960 was set just under \$240,000. The tax rate of 6.5 mills on a total valuation of about \$12,000,000 will bring in approximately \$73,000. A wage income tax of one percent of all money earned in the Borough or by people living in the Borough and working on the outside will provide \$66,000. Garbage collection fees will return \$33,000. The Recreation Department will bring in \$11,500, special assessments \$11,000 and permits \$6,525; miscellaneous income will aggregate about \$39,000. For street construction and maintenance approximately \$16,000 is received from gasoline tax and liquid fuel tax.

Departmental estimates of expenditures for 1960 were: Administration, \$29,700; Finance, \$3,000; Buildings, \$5,600; Police, \$46,000; Fire, \$5,500; Health and Sanitation, \$35,200; Highways, \$55,200; Recreation, \$11,500; and miscellaneous expenditures, \$42,600.

The Borough has 23 full-time employees and during the summer hires 20 to 25 people on a part-time basis.

* * *

Refuse Salvage Shows a Profit

The salvage and cardboard operations of Merced, Calif., showed a profit for the past fiscal year. Income from cardboard sales was \$7,000.62; tin can sales were \$434.00; and salvage operations yielded \$560.00. Gross income was \$7,994.02. Expenses included labor, \$4,055; truck, \$953.86; bales, \$465.87; and materials and supplies \$25.16. The total cost was \$5,499.89.

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EQUIPMENT NEWS



Truck Crane

A 20-ton-capacity truck crane which can handle long boom lengths, the P&H Model 225B-TC truck crane safely handles booms and jib extensions up to 140 ft. in length. Maximum lifting capacity for the unit is figured with a standard 40-ft. boom at a 12-ft. radius. Technically, this labels it with a Power Crane & Shovel Association classification of 12-104. All major gears in the crane portion of the unit are sealed inside to deliver maximum efficiency and require change of oil only once a year. Convenient re-

moval of certain components provides axle weight distribution for highway travel up to speeds of 40 miles per hour. The unit can be equipped with a dragline bucket, clamshell bucket, or pile driver—all using the standard 40-ft. boom used for hoisting work. The front-end crane attachment can be replaced with a backhoe attachment which digs to depths in excess of 21 ft.

Harnischfeger Corp., 4444 W. National Ave., Milwaukee 16, Wis.

Circle No. 11-1 on the convenient reply card facing page 34.

Snow Plow Wax

Slikote liquid spray can be used for application on plow areas difficult to reach by ordinary brush-on methods or it may be applied in the field to renew previous wax coats. It is also recommended for coating snow shovels or snow pushers used in conjunction with plows. Slikote places an invisible, slippery coating on all surfaces. One 16-oz. aerosol spray top can is included with each 5-gallon container of Snow-Rem snow plow wax.

Speco, Inc., 7308 Associate Ave., Cleveland 9, Ohio.

Circle No. 11-2 on the convenient reply card facing page 34.

Liquid Level Alarm

To sound an alarm or to actuate pumps, valves, warning lights or other electrical equipment, the Model 108C Liquid Level Alarm operates on diving-bell principle to serve as a normally-open switch. The alarm goes into action as the level of the water or liquid rises, causing air to be trapped in the unit's skirt and exerting pressure on its sensitive diaphragm that actuates the fully enclosed, protected switch.

Kenco Pump Div., 1305 Oberlin Ave., Lorain, Ohio.

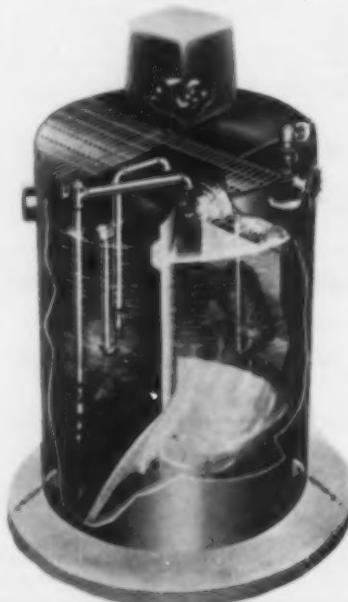
Circle No. 11-3 on the convenient reply card facing page 34.

Sewage Treatment

The RatedAeration SS, a factory-fabricated small cylindrical steel sewage treatment tank, uses the aeration process of sewage purification. The compactness of the unit, low original cost, low operating and maintenance costs and high efficiency make it the answer to sewage treatment problems for small communities, shopping areas, motels, factories, resorts, country clubs, etc. Completely odor and nuisance free, the steel unit can be installed above, or below ground, adjacent to, or away from buildings. Completely standardized and packaged, the unit incorporates a comminutor, aeration tank, forced air blowers, clarification compartment and a sludge air-lift pump. The clog-proof Hydro-shear aeration system utilized provides high oxygenation thereby increasing the purification power of the system. Plants are available in three sizes . . . 1000, 3000 and 5000 gallons per day.

Food Machinery and Chemical Corp., Chicago Pump Co., 622 Diversey Parkway, Chicago 14, Ill.

Circle No. 11-4 on the convenient reply card facing page 34.



Test Apparatus



A Joint Extension Machine for testing the strength of bonds formed by concrete pavement joint sealers is a product control device designed for use by highway departments, airport authorities, testing laboratories, military engineers and sealant producers. The machine is suggested for use in testing sealers of plastic and bituminous materials which are designed for pavement joints. The design and operation of the joint-bond apparatus is in accordance with Federal specifications, Corps of Engineers requirements and with the procedure of American Society for Testing Materials D-1191-52T. In the test, small cement mortar blocks 1 in. by 2 in. by 3 in. are bonded with the sealer. The operation of the testing machine simulates the expansion of a pavement joint. The cement blocks are pulled apart at the rate of $\frac{1}{8}$ in. per hour. Test specifications for sealers require that they must not elongate or lose bond past a certain number of inches (normally $\frac{1}{4}$ or $\frac{1}{2}$ in. per 2 or 4 hour period of time). The testing machine may be run at temperatures as low as -20°F .

Soiltest Inc., 4711 W. North Ave., Chicago 39, Ill.

Circle No. 11-5 on the convenient reply card facing page 34.

Fluorometer

Combining simplicity of operation with high sensitivity and long-term stability, the Model 111 Self-Balancing Fluorometer provides output signals suitable for continuous recording or for use with automation control equipment. Sensitivity is 2 parts per billion of quinine sulfate. Stability is ± 2 percent full scale from 105 to 130 volts and 50 to

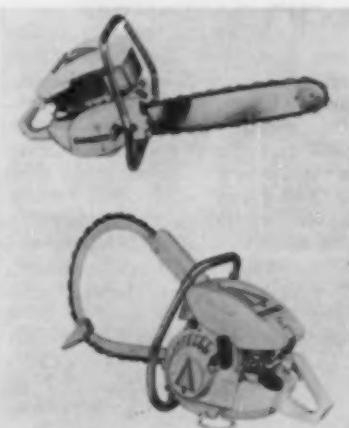
60 cycles per second input. 11 $\frac{1}{2}$ by 12 by 13 inches, the instrument weighs only 39 lbs. It is ruggedly designed for field operation and can be powered from a portable generator.

Because of the many hundreds of materials measurable by fluorescence techniques, this instrument offers application possibilities in oceanography, sewage disposal, insect control, meteorology, geology and biochemical research for example. All sample-handling equipment is mounted on the interchangeable front door. Seven different types are available for use with cuvettes, standard pellets for uranium analysis, paper chromatogram or electrophoresis strips, and continuous-flow measurements of fluids in various volumes. Although the unit will normally be used in recording or control, visual readings can be made at any time from the self-balancing dial.

G. K. Turner Associates, 2524 Pulgas Ave., Palo Alto, Calif.

Circle No. 11-6 on the convenient reply card facing page 34.

Chain Saws



The bow attachment for the 610 prevents binding, bending and pinching.

Attachments have been specially designed for the compact production model 410 and the professional model 610 chain saws. Cutter bars available in 6 sizes from 12 to 32 in. are designed for easy travel and less friction for the chain. Chains are match-mated to the cutter bars and come in four types: 1) General purpose; 2) hardwood chain; 3) medium wood; and 4) softwood.

Pioneer Chain Saws, Outboard Marine Corp., Waukegan, Ill.

Circle No. 11-7 on the convenient reply card facing page 34.

Heated Roller



The Hot Roll, model SP18, has been especially designed for the asphalt patching of everything from pot-holes to utility cuts. The intense heat of this 230 lb. propane-fired roller produces two major results: Compaction equal to a 5-ton tandem roller plus a smooth watertight surface. Both reactions are due to a heat flowing of the asphalt and results are equal on either hot or cold mix. Also used on the paving of sidewalks, patching next to curbs, in alleys, and municipal parking lots, the roller handle telescopes to 9 ft. for reaching wide areas. Carrier hooks attached to the twin handles enable the 18-in. wide unit to be lifted up and onto a truck tail gate for easy hauling.

Ellis Distributing Co., Box 168, Liberty, Mo.

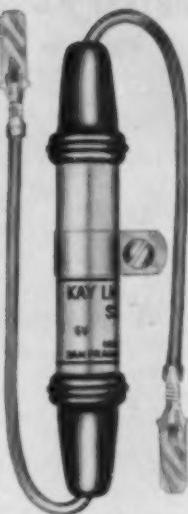
Circle No. 11-8 on the convenient reply card facing page 34.

Photo Control

A tubeless control for outdoor lighting, the "Multiplex" embodies two-component circuitry with eight single-pole, single-throw models that fit any NEMA-standard locking type fixture head. It can be adapted to any municipal, industrial and railroad installation, including pendant and old-style solid head fixtures, through the use of twelve mounting accessories. The control carries a one-year guarantee, which puts control replacement schedules in harmony with lamp life guarantees.

Precision Multiple Controls, Inc., 233 Chestnut Street, Ridgewood, New Jersey.

Circle No. 11-9 on the convenient reply card facing page 34.



Terminal Clips

To make installation easier, all Kay-Lab Stop-It in-line flashers are now fitted with terminal clips. Instead of splicing flasher into connecting wire, terminal clips simply plug into already installed flasher receptacle—replacement can be made in seconds. Flashers are made for 6, 12 and 24-volts with choice of fast flash of 90-100 flashes per minute for directional signals, or slow flash of 60-65 flashes per minute for law enforcement or emergency vehicles.

Macchi & Co., 819 Valencia St., San Francisco 10, Calif.

Circle No. 11-10 on the convenient reply card facing page 34.

Reading Machine

Both typed and printed business information can now be read directly into a computer memory for high-speed data processing. The new solid-state IBM 1418 optical character reader reads data printed in widely-used type styles on paper or card documents, at a rate of 480 characters per second. As many as 400 documents a minute may be read. The printed data is automatically translated into machine language for direct input to an IBM 1401 computer. The 1418 reads numbers printed ten characters to the inch in a standard IBM type by 407, 408, or 409 accounting machines, the 1403 printer, or an electric typewriter. It can also read numbers in the elongated 407 type style, commonly used by credit card imprinters, which is seven characters to the inch. In addition, the 1418

can be equipped for mark-reading—in which vertical markings made with ordinary pencil or dark inks represent specific information determined by the format of the document. The optical character reader handles documents of various sizes and thicknesses. Forms can be anywhere from 5½ in. to 8½ in. wide by 2¾ in. to 3 2/3 in. high. Their thickness can vary from that of bond paper to IBM card stock. Any printed documents within these dimensions—bills, notices, coupons, and continuous-card forms, for example—can be used as direct input to the 1418-equipped 1401 system. The data from the printed forms can be processed and the results produced as punched cards, magnetic tape, or printed reports by the 1401.

International Business Machines Corp., Data Processing Div., 112 E. Post Rd., White Plains, N. Y.

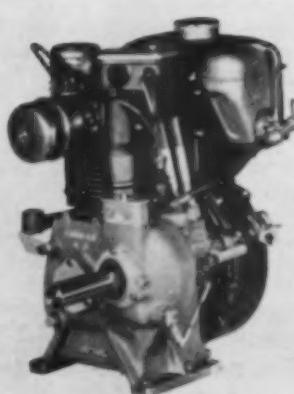
Circle No. 11-11 on the convenient reply card facing page 34.

Diesel Engines

A light weight line of self-contained air-cooled diesel engines in the 2 to 4½ BHP range is now available for powering portable equipment as well as emergency pumps and generators. Known as Yanmar, these 4 cycle, single cylinder engines operate in the 2000 to 3000 RPM range and may be obtained in two sizes with either crank shaft or half-speed cam shaft drives. Similar small diesels are also available in water-cooled models up to 8 BHP at 2000 RPM. Precision imports from Japan, Yanmar diesel engines have been manufactured to U. S. standards for the American market.

Continental Machinery Corp., P. O. Box 5309, Long Beach 5, Calif.

Circle No. 11-12 on the convenient reply card facing page 34.



Hydraulic Derrick

An Hydraulic Derrick for either front or rear mounting, features side, fore and aft and up and down movements allowing it to reach nine feet to either side from center line of truck chassis. This wide range of movements make it possible to park parallel with the curb and completely plumb any pole without the use of a pike. Adjustable side legs simplify the digging of anchor holes with minimum of truck maneuvering. Sheave heights of 25 to 29 ft. are provided. Allowance of an additional two feet to each of these sheave heights is provided by a single extension of the side legs. The derrick is designed to go to the ground and apply 3000 to 4500 lbs. down pressure on digger. It has a lifting capacity from 2500 to 12,500 lbs. It will body load 8500 lbs. and handle side reach position loads up to 3500 lbs. with a safety factor in all three positions. Simple boost rams elevate the mounting platform. Front installation improves the weight distribution on most 4 x 4 trucks, thus resulting in improved traction in off-the-road operation.

Utility Body Co., 1530 Wood St., Oakland 7, Calif.

Circle No. 11-13 on the convenient reply card facing page 34.

Portable Drill

The Minuteman Portable Drill is a compact multi-purpose, rotary unit designed for subsurface exploration and production drilling in soils, rock and concrete. The unit handles continuous flight augers from 3 in. to 12 in. in diameter and drives 6-in. diameter augers to 30-

ft. depths. When equipped for core drilling, it drives "EW" core barrels to 200 ft. When equipped for masonry drilling, it cuts 1 in. to 8 in. diameter cores from steel reinforced concrete in standard lengths required for quality control testing. As a production boring rig it also permits fast, economical erection of fences, guard rails, parking meters and similar installations. In addition, it handles standard soil sampling tools. The drill weighs 150 lbs. and features a 6 hp engine, 8 speed automotive transmission, diaphragm-type carburetor for drilling at any angle, 44-in. stroke with power or hand feed both in and out of the hole, wheel-mounted base and two-point anchoring for maximum stabilization in soils, rock or concrete. Although designed for one man portability, it may be adapted for truck or trailer mounting as well.

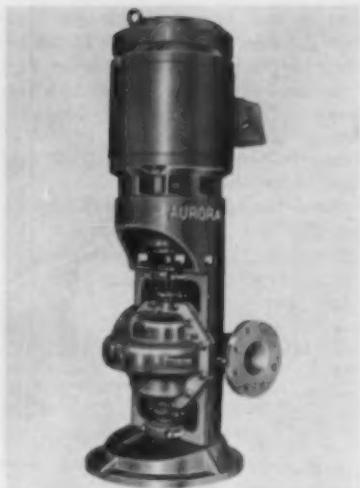
Mobile Drilling, Inc., 960 N. Pennsylvania St., Indianapolis 4, Ind.

Circle No. 11-14 on the convenient reply card facing page 34.



Centrifugal Pumps

Reduced space requirements for the new line of OJV and OMV Vertical Split Case Pumps makes them ideal for application where extreme compactness is of prime importance. The case is split parallel with the impeller shaft with the suction and discharge flanges integral in the vertical base section. Rotating unit is removed easily for inspection or maintenance without disturbing the suction or discharge piping connections. Perfect bearing alignment is achieved with in-line boring with top half of case in position. Double suction impellers are hydraulically and dynamically balanced for smooth quiet operations. Ideal for handling high capacities at medium



to high heads and continuous operations, these pumps are used on applications such as marine services, municipal water service, industrial water service, booster service, cooling towers, fuel service, circulating and boiler feed. Capacities range to 6000 GPM and heads to 380 ft.

Aurora Pump Div., The New York Air Brake Co., Aurora, Ill.

Circle No. 11-15 on the convenient reply card facing page 34.

Work Stand

This hydraulically-operated work stand, featuring an extendable work platform that raises to a height of 100 ins. above the floor, has a working platform area, with folding side catwalk in raised position, of 56 in. by 126 in. In lowered position, platform is 30 in. above the floor. Guard rails are of tubular steel. Positioners hold stand firmly to floor or ground when in use. Stand is available with variations in size and certain other details.

Bil-Jax, Inc., Archbold, Ohio.
Circle No. 11-16 on the convenient reply card facing page 34.



Line Stripper

This simplified line stripper designed to apply safety guide lines and a variety of other lines is capable of producing up to 500 ft. of lines before refilling. Gravity feed paint control is accurately controlled at a waist-level handle grip. Lines are applied by guiding the four-wheel line marker and walking at a normal speed. Straight or curved lines can be made with equal ease in 2, 3, or 4 in. widths by changing the fiber brushes. Marker is used for a wide range of applications including game courts, parking lots, stalls and safety guide lines. Straight-through feed valve and simplified aluminum tank construction permits easy cleaning and paint recovery after completion of painting.

Cost Reduction Equipment Co., 5200 Chakemco St., South Gate, Calif.

Circle No. 11-17 on the convenient reply card facing page 34.



Luminaire

A mercury vapor luminaire, tailor-made specifically for residential street lighting, incorporates a change in refractor lens design that will boost street lighting efficiency and turn brightness away from bedroom windows. The luminaire, which will operate with 100-watt, 175-watt, or 250-watt mercury vapor lamps, is lightweight, compact and streamlined. The luminaire offers increased photometric efficiency for residential street lighting, achieved by introducing curved surfaces to the refractor lens prism, allowing a 70 degree "bend" to light ray emission. The unit has the inherent efficiency of mercury vapor lighting.

General Electric Co., Schenectady 5, N. Y.
Circle No. 11-18 on the convenient reply card facing page 34.

Hose Coupling



The hose coupling assembly, called the Band-It "Piggyback" Tri-Lokt hose nipple is available in five sizes ($\frac{1}{4}$ -in. to 1 in. I.D.) to fit any hose O.D. or wall thickness regardless of the hose construction or type of service. The hose nipple assembly may be used for hydraulic hose, double braid and single braid steam hose and all types of hose which require a positive lock to the hose nipple. It is an all-purpose, reusable hose nipple employing a stem designed to minimize abrasion within the hose. It locks in three places in addition to the familiar clamp and nipple methods now in use. The assembly consists of one hose

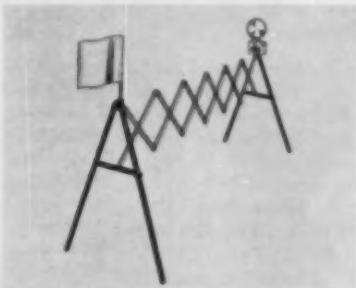
nipple and one yoke, locked by two stainless steel clamps. In addition, nipple is held in place by the yoke tie-ends and by the anchoring force of the yoke upon the nipple. All sizes are available in NPT (American) and BS-21 (British) taper pipe threads.

Band-It Co., 4777 Dahlia St., Denver 16, Colo.

Circle No. 11-19 on the convenient reply card facing page 34.

Folding Barricade

The folding steel barricade opens to a full 8-ft. width, yet folds to 11 by $2\frac{1}{2}$ by 36 in., small enough to



be carried in any type of vehicle. Durable all-metal construction, legs are made of steel tubing, the cross members of reinforced channel, glass-bead reflectorized for added visibility in either direction. Finished in yellow and black enamel. Furnished with two red fluorescent danger flags. Flashers are optional.

Albert W. Pendergast Safety Equipment Co., Tulip & Longshore Sts., Philadelphia 35, Pa.

Circle No. 11-20 on the convenient reply card facing page 34.

Universal Joint

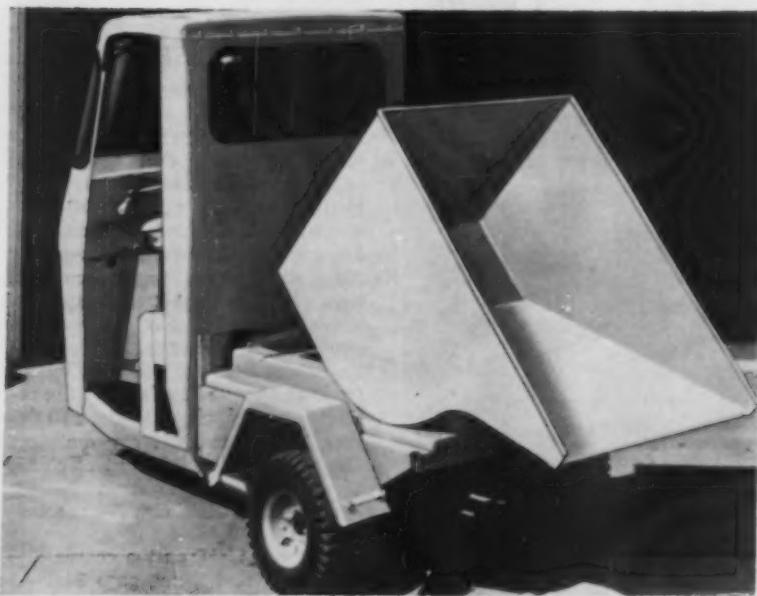
Band-Ell, a four-piece universal joint which permits perforated drainage pipe sections to be joined at any angle from 0 to 90 degrees, right or left, has been developed for use with 6-in. diameter Hel-Cor perforated subdrainage pipe. Sections are interlocked and fastened to pipe ends with either bolts or wedge fasteners, after which the desired angle can be attained by varying the location of the flanges in relation to the top of the pipe. This universal joint remains tight through earth shifts, frost upheavals.

Armeo Drainage & Metal Products, Inc., 9360 Curtis St., Middletown, O.

Circle No. 11-21 on the convenient reply card facing page 34.



Truckster



The 780 Truckster is designed for use in street cleaning, trash collection, light construction hauling, and other similar applications with an 11-cu. ft. dump hopper that will carry an 800-lb. payload. It delivers 50 mi. per gallon and is powered by a 7.95 hp, 4-cycle high compression engine with a constant mesh transmission with three forward and one reverse speed. It also has hydraulic brakes on all three wheels and an independently operated parking brake. The overall dimensions are 48-in. by 102-in. Cab height is 68 $\frac{1}{2}$ -in. and width, 40-in. The fibre glass and steel cab is available as optional equipment. An electric self starter is also available. The hopper is 29-in. high by 31-in. wide by 42 $\frac{3}{4}$ -in. long; has a release catch and empties by gravity. After dumping it is returned by hand to its original loading position.

Cushman Motors, Lincoln, Neb.

Circle No. 11-22 on the convenient reply card facing page 34.

Level Loader



A self-leveling, high capacity loader has been designed for use with the International 660 tractor. To take full advantage of the tractor's built-in brawn, International Wagner No. 625 loader has heavy reinforced lift arms braced at bucket end to produce rigidity at full load. The unit welded tubular frame construction, bolstered with gusseted braces, gives strength and durability. Spill back is eliminated by the self-leveling action. With the tractor's internal hydraulic system, 4,000 lbs. can be raised to full height of approximately 13 ft. in 7½ seconds.

International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill.
Circle No. 11-23 on the convenient reply card facing page 34.

Sewer Cleaner



The Marco Powerfeed Model 70 features two light-weight quick-change cartridge drums to gain greater distance and lend to its portability. It is also provided with an on-off automatic feed drive. The unit can be quickly assembled and disassembled for weight distribution. With interchangeable handle it can be operated from right or left side and works with equal effectiveness in any direction. The cleanout and

Mobile Welder



The Weldmobile is a self-contained, self-propelled welding unit, with engine directly coupled to the generator. The unit is designed to provide a mobile welding unit for installations in which welding applications occur at widely separated points. By traveling directly to the job and being ready to weld without waiting for electricians to hook up power lines, the unit saves hours of time. Since its towing capacity is rated at 2,000 lbs. draw-bar pull, it can tow other equipment or ma-

terial to the job. In addition to welding power, the Weldmobile can supply up to one kilowatt (110 volts DC) auxiliary power for operating lights and electric motor powered equipment. Two wells and brackets are located at the rear for acetylene and oxygen tanks. Welding, traveling and power controls are centrally located in front of the driver's seat on a special dashboard.

Hobart Brothers Co., Troy, Ohio.
Circle No. 11-24 on the convenient reply card facing page 34.

removal of grease, rust, roots, scale, rags and other foreign matter is effectively accomplished through the use of quickly attachable, specially designed heads. The complete unit includes: On-off feed drive; two light weight quick-change cartridges (each with $\frac{3}{4}$ " x 55 ft. springs); marco heads 3", 4" and 6" cutter, spear fin, auger and retriever; General Electric $\frac{1}{2}$ hp, 115/230 volt capacitor motor with reverse and operating switch. Frame is of strong, tough, light-weight tubular steel, and provided with hard rubber tire wheels.

Marco Products Co., 3416 Vineyard Ave., Los Angeles 16, Calif.
Circle No. 11-25 on the convenient reply card facing page 34.

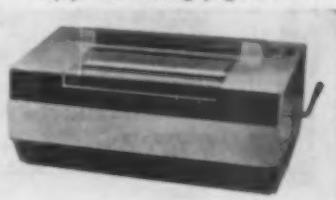
Photocopier

A lightweight (22 lbs.) compact portable photocopier, the Contouromatic Mark III makes photo-exact permanent black and white copies of any mark on paper . . . including ball point pen, colored inks or crayon, spirit duplication, rubber-stamped copy. Extra wide (up to 12 in.) originals of any

length can be copied on regular bond-type, featherweight or card stocks as well as various films for reproduction masters.

The exclusive Seal-Pak, a disposable sealed plastic container, eliminates all chemical handling, prolongs solution life. The copier puts all controls, copying operations, paper storage up front for easy access; machine may be placed against a wall or in a corner, saving desk space. Single action control lever located at the side of the machine activates the mechanism—causes the solution to flow into the processing chamber. Automatic press-flow design keeps solution fresh, free from evaporation until machine is turned on.

F. G. Ludwig, Inc., Old Saybrook, Conn.
Circle No. 11-26 on the convenient reply card facing page 34.



Roller Reader



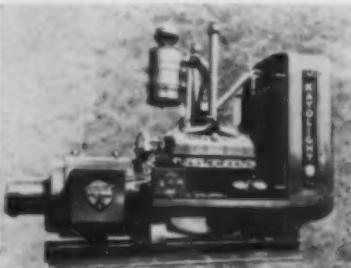
The reader permits easy office handling of strip chart records without the need for spreading them out. With the unit, a 60 or 120 day chart may be scanned in its entirety. The roll is attached to two spindles and may be cranked in either direction to allow study of specific periods of operation. Sturdy metal platform permits notes to be entered in appropriate sections. Portions containing significant operating data may be clipped from the chart and cataloged for ready reference. The remaining chart can be spliced together and stored separately. Writing platform and chart winders are light grey and wood-mounted.

Hersey Sparling Meter Co., El Monte, Calif.

Circle No. 11-27 on the convenient reply card facing page 34.

Generating Set

A 125 KW generating set especially developed to meet emergency requirements in modern industrial and public buildings features unitized compact design incorporating Katolight generators, and is available in all standard voltages



equipped with either close regulating static or rotating exciters, and voltage regulators. The generator is driven by a V8 Roiline engine and can be equipped with gasoline, natural gas, or propane carburetors. A variety of controls, throw-over switches, safety and signal devices are also available.

Katolight Corporation, Mankato, Minn.

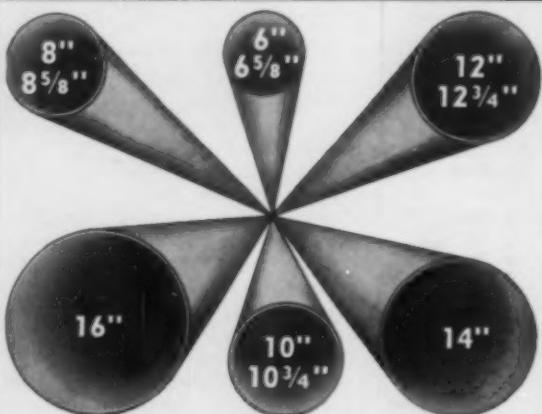
Circle No. 11-28 on the convenient reply card facing page 34.

Salamanders

The No. 1412 Floor Type Salamander with a heavy 14-in. diameter base made of 13 gauge steel, has a maximum capacity of 150,000 BTU per hour (at 100 psi). It operates without a pressure regulator, burns clean, smokeless, odorless LP-Gas fuel. High pressure hose, used to connect the No. 1412 to the fuel cylinder, can be supplied with an excess flow check.

Insto-Gas Corp., 998 E. Woodbridge, Detroit 7, Mich.

Circle No. 11-29 on the convenient reply card facing page 34.



NEW high frequency, resistance welded pipe

If you want a closer source for pipe that meets the highest standards of the industry, better talk to Valley. New resistance welding and process control facilities assure you of the quality you demand. Ideal as line pipe for gas, water, air conditioning ducts, etc. Special wrappings and coatings. Steel piling also available.

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NEWS OF ENGINEERS

A. FREDERICK GRIFFIN, special engineering consultant, North Central Division, Corps of Engineers, Chicago, has retired after 34 years of service. He was the guest of honor at a luncheon of the Western Society of Engineers on the occasion of his retirement.

JAMES B. RAMSEY, Chief Engineer and Superintendent of the Water Department of Kansas City, Mo., has been made assistant secretary of the American Water Works Association.

HAROLD F. CLEMMER, long time engineer of Materials of the District of Columbia, died Oct. 5. A graduate of Iowa State, he was well known as an authority on engineering materials.

* * *

Program of National Pollution Conference Announced

Invitations from the Surgeon General of the U. S. Public Health Service have been sent to more than 300 national groups and organizations, asking them to send representatives to the first Federally sponsored National Conference on Water Pollution. The meeting will be held at the Sheraton-Park Hotel in Washington, D. C., December 12-14. It is designed to give participants a review of the water pollution problem in the United States and a chance to share in developing new national agreements on pollution control policies.

It will open with a plenary session Monday, December 12. Four panel sessions will meet concurrently on Tuesday. A second plenary session on Wednesday will be devoted to reports of panel chairmen, floor discussion, and summarization.

Tuesday's panel sessions will be concerned with 1) effects of pollution on health, welfare and economy; 2) pollution control to increase available water supplies; 3) responsibilities of government, industry and the public to keep water clean; and 4) critical needs for research, resources and training.

The Monday banquet program will include addresses by Senators Robert S. Kerr of Oklahoma and Francis Case of South Dakota, and Representatives John Blatnik of Minnesota and William Cramer of Florida.

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A man experienced in valve sales and in allied work in the industrial and hydraulic fields is available. Good record of experience and excellent references. Presently located in New England.

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Leading manufacturer of water, sewage and waste treatment equipment seeks two technical men: (1) Process service man for plant start-up with background in water plant operation and laboratory procedures; familiarity with sewage treatment field also desirable. Travel involved. (2) Sanitary Engineer with some experience, for engineering positions leading to sales engineering. Please submit resume of qualifications, experience, desired salary range, etc. to:

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City Hall
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Graduate sanitary engineer with minimum 3 years experience and contacts selling sewage, water and industrial waste treatment plant equipment to Midwestern consulting engineers and contractors. Salary open. Send complete resume of experience and background to:

M. Kaiser
Elmco Corporation
301 Hicks Road
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Good opportunity for aggressive salesman to join the firm of leading manufacturers' agents and representatives. Handles top accounts in the water supply, industrial waste treatment, sewage disposal, sludge conditioning, refuse disposal, water purification, swimming pools and process water fields. Send resume to:

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College graduate, majored in arboriculture with 5 years experience in private firm. Age 27. Member Arborist of Mass., Arborists Assoc., N. H. Arborists Assoc., and North Shore Tree Conference. Desires position in Municipal tree care. New England or vicinity preferred.

Write to:

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50,000 gallon capacity, 104 ft. base (two 27, one 50, sections). Overall ht. tank and base 122 ft. Built by Pittsburgh Des Moines Steel in 1951. First class condition but no longer needed in our operation. Sacrifice as is.

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Att: R. B. Morgan

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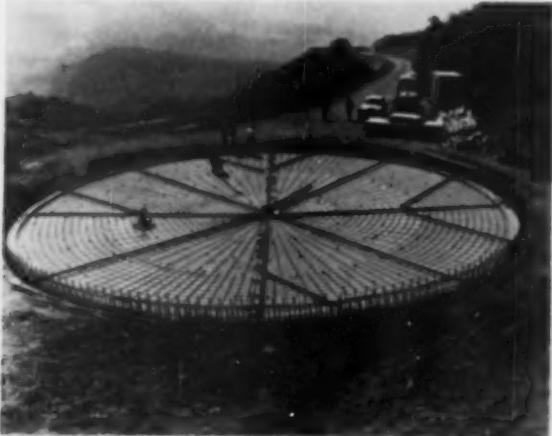


In a scene repeated in many other states, New Jersey's Governor Meyner, seated, signs a proclamation declaring the week of October 2-8 as "Public Works Week." Looking on, left to right, are Frank McGrath and Edward P. Decher, respectively Assistant Secretary and Secretary, Joint Meeting Sewer Commission, Newark, N. J.; Arthur T. Brokaw, Borough Engineer, Princeton, N. J.; Mayor Raymond F. Male of Princeton; and Charles Kier, New Jersey District Chairman of Kiwanis International.



-Worth Seeing

Sidewalk superintendents get a treat as a 100-foot, 5000-lb. microwave antenna pole is erected atop the framework of the new Canton, Ohio, City Hall. The towering pole, manufactured by Union Metal Manufacturing Co., Canton, is made in two 50-ft. sections. The location was chosen to give greater range and better reception for police radio.



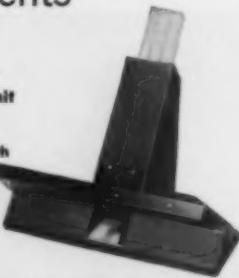
Vinyl plastic sandwiched between two slabs of concrete forms a water barrier for the base of this reservoir. Fabricated into one piece at the job site, the Koroseal plastic supplied by B. F. Goodrich Industrial Products Co. is 72 feet in diameter and covers 3,850 sq. ft. The 560,000 gallon reservoir is being built for Los Angeles County near La Verne, California.



Recently purchased by the Borough of Mt. Union, Pennsylvania, this Caterpillar No. 933 Traxcavator will put an existing dump in condition for use as a sanitary landfill; then will be used jointly for landfill and for street department and other departmental use. Details of the cost estimates leading to this purchase were published in the October issue of PUBLIC WORKS.

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by Arthur K. Akers

★ Frink Sno-Plows Inc., Clayton, N. Y., advises that despite their fire on Sept. 14, "the company will meet all current and anticipated orders for the 1960-61 season." Showing that you can't keep a good company down!

★ W. S. Dickey Clay Mfg. Co. celebrates its 75th corporate birthday with the completion of its Birmingham-Bessemer, Ala., plant, replacing one destroyed by fire last November. Its initial capacity will be 55,000 tons a year.

★ Robert E. Cross is named sales manager, Bermico line of conduit and sewer pipe of Brown Co., Boston and Berlin, N. H.

★ Kent S. Clow, Jr. named to the newly created post of assistant to the president, James B. Clow & Sons, Inc., makers of cast iron pipe, valves, fire hydrants.

★ J. I. Case Co., Racine, Wis., appoints A. Earl Lee as marketing coordinator of all Case lines of tractors and kindred equipment.

★ Eugene P. Berg elected executive vice president, Bucyrus-Erie Co. He was previously general manager of all Chicago operations of the Link-Belt Co.

★ Sparkler Mfg. Co. has formally opened its new sales headquarters and plant at Conroe, Texas. They were formerly located in Mundelein and North Chicago, Ill.

★ Jacobsen Mfg. Co. unveiled more than 50 new and improved products at a week-long series of sales sessions at their Racine, Wis., plant. Jacobsen is also responding to the power mower sales opportunities inherent in the Interstate highway program with its eventual million acres of grassed area to be mowed.

★ The American Wells Works promotes John C. Loos, Jr., to assistant to the president.

★ J. F. Fuller becomes manager Los Angeles branch, Hersey-Sparling



Mr. Fuller



Mr. Hersey

Meter Co. Peter H. Hersey, formerly of Needham, Mass., will be an aide of Mr. Fuller's. Other personnel changes include E. G. Carder, assistant manager Dallas branch; John Meharry, manager Portland, Oregon branch; J. H. Snellgrove, assistant manager, Chicago branch.

★ The recent earthquakes remain a huge and current problem in Chile. To help mitigate the water difficulties of the country, The Permutit Co. Division has sent six package purification plants there, through UNICEF.

★ Arthur C. Frank promoted to district manager, and Daryl E. Galennie assistant sales manager, of the Holan Corporation, Cleveland.

★ John H. Hase elected chairman of the Contractors Pump Bureau for the coming year. J. C. Gorman, of the Gorman-Rupp Co. continues as member of the Board of Governors of the Bureau.

★ Hauck Mfg. Co., Brooklyn, was awarded contract for 296 asphalt trailer kettles by the Pennsylvania Department of Highways. It is reported to be the largest order of its type ever placed by a State.

★ Leon H. Bates is appointed plant manager, Tractor Loader Division, Eimco Corporation, Salt Lake City.

★ We never used to be able to find Grandmother's glasses, but now she leaves them right where she emptied them.

—Deco Trefoil

Refuse Collector "Doubles" in Snow Removal



Dumpmaster clearing bridge prepares to empty snow scoop into its compaction body.

DEMPSTER-DUMPMASTER with Snow Scoop Performs Valuable Emergency Duty . . .

The DEMPSTER-DUMPMASTER, in service in most leading cities as a collector of containerized refuse or as a hand-loaded packer for trash and tree trimmings, now offers its owners still another valuable service. With the addition of a low-cost, snow-scoop container, the Dumpmaster becomes a highly efficient snow-removal device.

Taking up only one lane of traffic, the Dumpmaster moves along the curb, driving its snow scoop into the piled-up snow. When full, the scoop is lifted overhead and emptied into the compaction body hopper. Here, it is compressed by the 60,000-pound pressure of the packer plate, making room for bigger pay loads.

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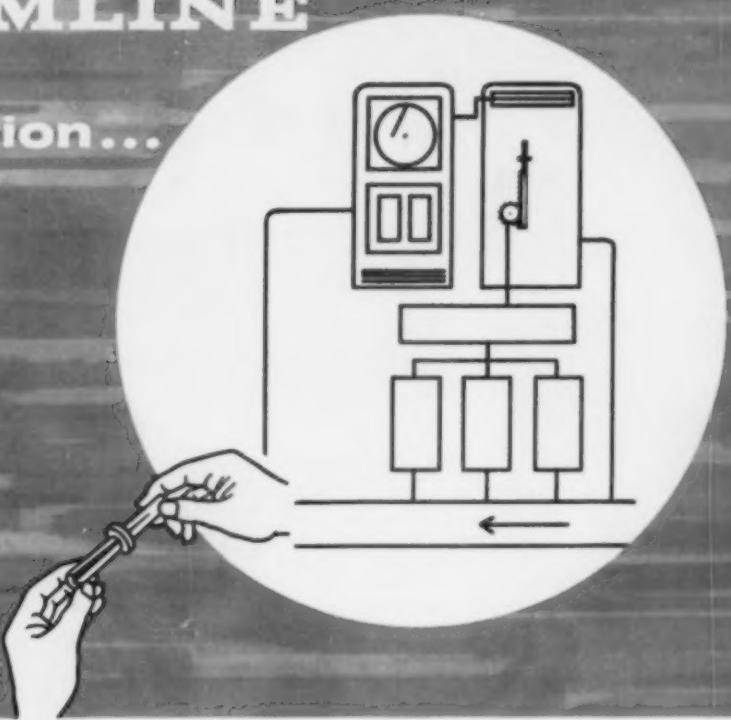


Snow is dumped into compaction body.



Huge cube was once traffic-clogging snow.

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With automation by Wallace & Tiernan your chlorination system controls itself...needs almost no attention. With Compound-loop Control, the residual you select is maintained, no matter how much water flow or chlorine demand changes. You're always sure of water quality.

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